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THE OPERATIVE TREATMENT OF HERNIA BY LIVING SUTURES*

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IN discussing the later methods of repair of hernia, it seems appropriate to review at some length the history of operative treatment of this condition, to trace the course of surgical procedure, and to show wherein its limitations have ever served to stimulate the adoption of varying methods of attack.

Since the advent of modern surgical treatment, Macewen was one of the first to advocate free exposure of the sac and adjacent structures of the inguinal canal. He excised a portion of the sac and, folding the remainder into a boss or tampon, sutured it inside the internal ring. Marcy and Lucas-Championnière ligated and excised the sac near the internal ring. Ball opened the sac, freed it of adherent omentum, ligated and twisted it. Earlier operators did not remove the sac. Czerny opened the sac at the internal ring, and closed it with a purse-string suture. Socin used a purse-string suture at the neck, divided the sac transversely below this point, and left the lower portion undisturbed, pushing the upper portion of it up inside the internal ring. It is interesting to note that the older surgeons believed that a wound that healed by suppuration had a stronger cicatrix, and McBurney packed the wound with gauze to prevent its healing too rapidly.

Thus far, the methods in use involved no attempt to reconstruct the inguinal canal. Marcy, in 1881, was the first to recommend high ligation of the sac, transplantation of the cord, and reconstruction of the inguinal canal as done at the present time. His other noteworthy contributions were the use, for the first time, of kangaroo tendon sutures, and closure of the wound without drainage. Bassini a few years later described the method that still bears his name and has become a standard procedure for the repair of inguinal hernia the world over. The chief points in his operation are: high dissection and ligation of the sac, cord transplantation, and restoration of the posterior canal wall by approximation of the internal oblique and transversalis muscles and their conjoined tendon to Poupart's ligament. Believing that the Bassini method modified so as to leave the cord undisturbed might be an improvement, Bull and Coley (William B.) in 1892 described an operation with suture of the internal oblique and transversalis muscles to Poupart's ligament over the cord. Ferguson's operation, devised and published in 1899, is similar in all important respects. However, in a parallel series of cases at the Hospital for the Ruptured and Crippled, Bull and Coley found the percentage of recurrence considerably greater than where cord transplantation was done, so they abandoned the routine use of the method.

As larger series of carefully followed

* Results from the Second Surgical (Cornell) Division, Bellevue Hospital.

hernia cases operated upon by the Bassini method began to be accumulated, it soon became apparent that, especially in obese or poorly developed subjects, or where the hernia was of the direct variety, the recurrence rate was decidedly high. As a result, a number of modifications were devised to further fortify the inguinal canal wall posteriorly. Among the most prominent of these was the rectus transplantation, advocated by Wölfler as early as 1892. He incised the anterior rectus sheath, drew the muscle down, and sutured it to Poupart's ligament. Bloodgood sutured both the rectus muscle and its sheath, together with the conjoined tendon and internal oblique, to Poupart's ligament. Halsted, Hotchkiss, Lusk, and Berger secured a triangular flap from the anterior rectus sheath and sutured it to Poupart's ligament. Of all the varieties of rectus transplantation, the method of Downes has been most widely used and is, we believe, the best.

Belief that further reinforcement could best be obtained by using the external oblique aponeurosis as one of the layers of the repair was the view of Lucas-Championnière and, as practiced by Andrews (1895), it is an excellent method. It consists in overlapping, or imbricating the external oblique aponeurosis as an additional supporting layer after the deep sutures have been placed. As described by Andrews, the median edge of the external oblique aponeurosis is sutured to Poupart's ligament and the cord is placed on its new bed. The lateral edge is then lapped over the cord and sutured by a running stitch to the surface of the upper flap.

Schley and Stetten simultaneously described similar modifications of this method which have seemed to us to be an improvement of real value. They overlap the lateral leaf of the external oblique beneath the cord instead of over it. Thus, the cord lies beneath the skin and subcutaneous fat instead of between two firm and relatively unyielding fascial layers; moreover, the strength of the repair is enhanced by one more layer of fascia. Of the two, this last consideration has seemed to us the more important. We feel that this type of repair is preferable to transposition of the rectus muscle for two reasons: first, it is anatomically sound; and second, it makes use of a broad apposition of fascial planes without tension. In theory, diverting a portion of rectus muscle to an oblique position from its normal vertical one, has always seemed to us anatomically unsound, and the results obtained have not warranted its adoption on empirical grounds.

Use of Fascia Lata in Hernia Operations

Kirschner used a free patch transplant of living fascia lata taken from the thigh to reinforce the repair, tacking it over the line of suture of the external oblique aponeurosis. He stated that it had the following advantages: its accessibility, abundance, strength, inelasticity, and readiness to heal in when transplanted.

McArthur, in 1904, utilized a strip of external oblique aponeurosis cut parallel to the customary incision made in it in the operation for inguinal hernia, but leaving it attached at its lower extremity, to suture the conjoined tendon to Poupart's ligament. This operation may be considered as a forerunner of the Gallie-Le Mesurier operation. It has the advantage of avoiding the operation upon the thigh, and is practically as simple as the ordinary Bassini method. It is of use in small direct hernias and in those of indirect type where the muscle is lacking in amount or in quality. The amount of suture material available from this source is limited and its quality is distinctly inferior to the fascia lata taken from the thigh. In large direct hernias, we feel that the use of McArthur's living-suture method will not offer as much additional strength as a Gallie-Le Mesurier operation.

Gallie and Le Mesurier found as a result of considerable animal experimentation, that patch transplants gave way at the

site of attachment to the edges of the defects and showed a tendency to balloon out in consequence. They devised a most ingenious method of repair using strips of living fascia lata from the thigh as sutures, and weaving them across the defective inguinal canal, thus creating a new wall of living tissue which was anchored securely to Poupart's ligament laterally, and to the conjoined tendon and muscle mass of internal oblique and transversalis internally. It is this operation which we have adopted for difficult closures of large indirect and direct hernias and especially for recurrent hernias, and ventral and umbilical hernias. The technique described by us is in the main their operation.

The operation, as performed by us, requires three surgeons and two nurses. There have been occasions when we have contented ourselves with the services of but a single nurse, an arrangement which does well enough where all the persons concerned are accustomed to operating together on this type of case; but the presence of an additional nurse greatly facilitates matters and insures smoother and quicker work.

The illustration will suffice to make clear the mode of draping the patient which experience has taught us to be the simplest and best. The painting of the skin of abdomen and leg with iodine is done before a single sterile cloth is adjusted, an assistant seizing the foot and holding the leg well up while the iodine is applied in a continuous coating extending from the abdomen well down upon the calf and including the posterior as well as the anterior surface of the limb.

The fascia strips should be taken from the thigh opposite the side on which the hernia is situated in order that the surgeon preparing the sutures may interfere as little as possible with the chief operator. If a bilateral hernia is to be repaired at one sitting, the operator should begin on the side opposite that from which his assistant is procuring the suture material. In reality, two separate and distinct operative procedures are being simultaneously performed upon the patient, and separate instrument tables must be arranged. The surgeon working upon the thigh should sit on a small stool, as this will bring the part to a convenient level, and keep him out of the way of the two men engaged in the actual hernia repair. We begin on the hernia and on the leg at the same moment, finding that by the time the assistant has prepared the living sutures and closed the wound in the thigh, the operator is generally ready to begin the actual repair of the inguinal canal. In this way an extra assistant is at the disposal of the surgeon at the time when he is most needed.

When we first began using the Gallie method, we were in the habit of simply exposing the fascia lata of the thigh by an appropriate incision and removing the strips as called for by the operator; but we have since abandoned this practice because of the delay which it involves, and because it deprives the operator of the assistance of the second surgeon, who, when using this technique, is kept continually busy up to and beyond the finishing of the main operation. As soon as the necessary number of fascial strips have been fastened in the Gallie needles, they are wrapped in a piece of sterile gauze moistened with warm physiological salt solution and laid aside until needed. We have found that placing them in a bowl of saline solution is inadvisable, as the fascia becomes soft, waterlogged, and prone to tear if left in the solution for more than a few minutes. If left in moist gauze, they keep in far better condition, and we have never found any disadvantage connected with this practice. It is well to rotate inward the leg from which the sutures are to be taken, and to maintain it in this position by placing a sand bag across the foot. A far better access to the outer surface of the thigh is obtained by so doing. The question whether it is worth while attempting to close the defect left in the fascia lata of the thigh after the suture strips have been

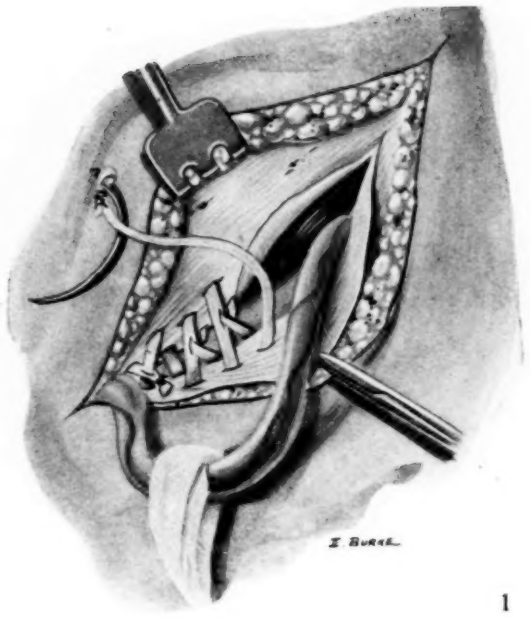
removed, has often arisen. Various surgeons whom we have interviewed regarding this point have been of different opinions. We ourselves do not favor its closure. There is often a considerable degree of tension. We have recently had to perform a second living-suture operation upon the same individual, and in this case, we exposed the thigh at the site of the previously removed sutures; we found that the defect in the fascia had been completely obliterated, with the formation of a new and equally strong aponeurotic layer from which we were able to take our sutures for the second operation. The skin incision over the external aspect of the thigh is closed by interrupted silkworm gut sutures. A number of our patients have complained of a feeling of tenseness in the leg during the first day or two after leaving their beds, but this has always disappeared within a very short time.

As both of us favor an overlapping type of operation for all direct inguinal hernias, we have adapted the Gallie technique to this mode of repair, and the great majority of the cases in the series herewith presented have been so dealt with. The accompanying illustrations will make the technique clearer than a verbal description could possibly do. We have found, particularly in those cases where the hernia was unilateral, that there is often surprisingly little tension, especially in somewhat emaciated individuals with relaxed abdominal walls, so that the "sock darning" use of living sutures may be unnecessary. In these cases, we have approximated the conjoined tendon and the fibers of the internal oblique to Poupart's ligament with the continuous living suture precisely as if doing the ordinary type of overlapping repair, the operation differing from this last only in so far that strips of fascia lata were used as a running suture in place of the usual interrupted sutures of chromic catgut or kangaroo tendon (Fig. 1). In those cases in which there appears to be marked tension when the conjoined tendon and the internal oblique muscle are brought into contact with Poupart's ligament, we adopt the "sock darning" type of repair, using as many as three strips of fascia for this purpose. A second row of deep sutures is superimposed upon the first row, traversing the conjoined tendon and internal oblique and transversalis muscles more medially and Poupart's ligament more laterally than the first row. This second row serves to secure a very firm anchorage internally and prevents there being any tension on the first row of sutures (Fig. 2). In cases that are many times recurrent, with little or no conjoined tendon and internal oblique muscle, the innermost attachment of this second layer may include the edge of the rectus, without any effort, however, to draw this structure upwards to Poupart's ligament, but using it solely as an anchorage for the sutures which, themselves, bridge the gap.

The deep layer of sutures having been completed, we approximate the medial leaf of the external oblique to Poupart's ligament (Fig. 3), and then overlap the lateral leaf suturing it to the superficial surface of the medial leaf (imbrication of the external oblique beneath the cord); thus, at the completion of the operation, the cord lies subcutaneously (Fig. 4). If there is an insufficient amount of aponeurosis to permit of this overlapping, we content ourselves with suturing the edges of the external oblique beneath the cord without overlapping.

Of course, it is by no means essential to follow the pattern of interweaving here illustrated (Fig. 2); any other that bridges the defect thoroughly and is so locked as to prevent sliding of the suture upon itself will do equally as well.

Postoperative Course. The dressings are applied separately to the hernia and thigh wounds and are so fastened as to permit of inspection of the one without exposure of the other. Sterile gauze leg rolls are used to swathe the thigh incision and the use of a spica bandage is advocated to support the inguinal dressings firmly



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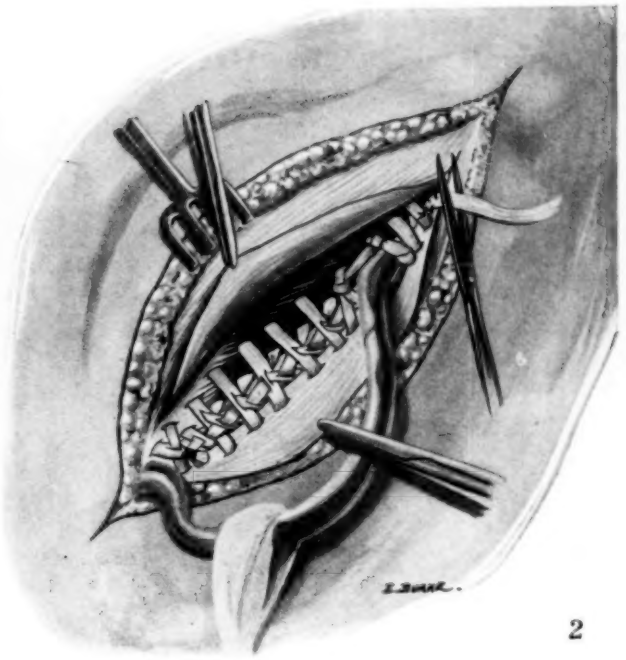

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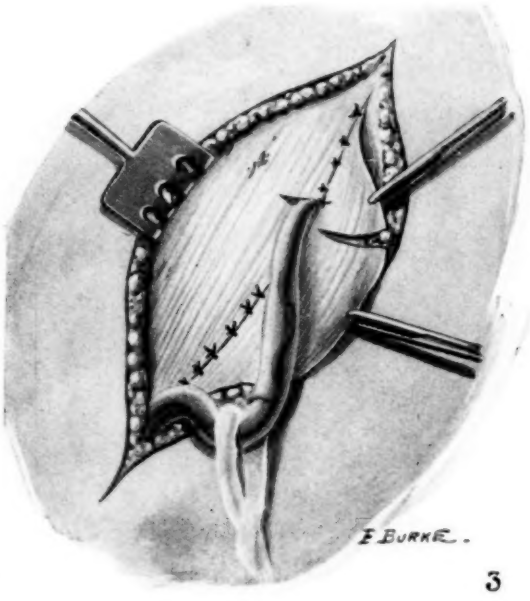

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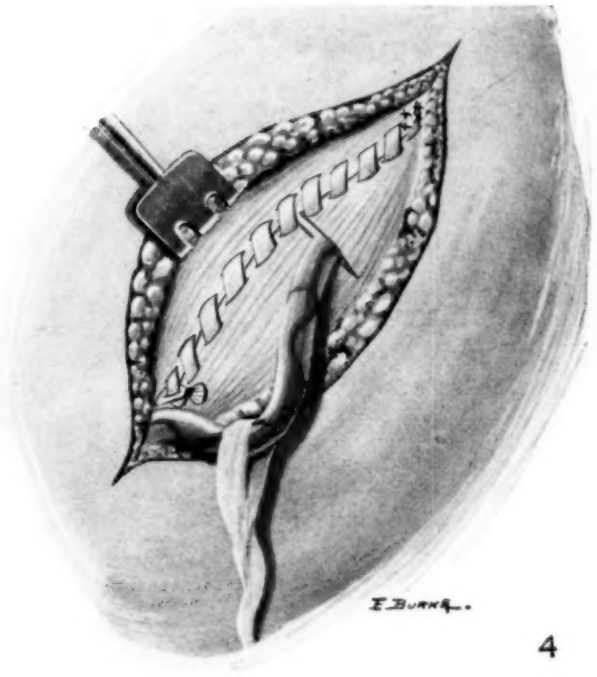

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FIG. 1. Beginning of first layer of living suture. Note: This figure represents the medial leaf of the external oblique included in the suture line, which we do not generally practice. (See Fig. 2.)

FIG. 2. Completion of first and second layers of living suture. Note the method by which point where the cord emerges at the internal ring is protected by circumferential living suture.

FIG. 3. Medial leaf of external oblique aponeurosis stitched to Poupart's ligament with interrupted chromicized catgut sutures.

FIG. 4. Completion of overlapping by suture of edge of lateral leaf of external oblique aponeurosis to surface of medial leaf. Note: This step is depicted as with the use of living sutures. As a rule, chromicized catgut is used for this layer; or the external oblique is simply closed beneath the cord with a living suture, no attempt being made to overlap.

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and to maintain even pressure on the incision; this tends to prevent the accumulation of blood and serum in the subcutaneous space. All cases are placed in the Gatch position with knees elevated and shoulders raised to take tension off the repair.

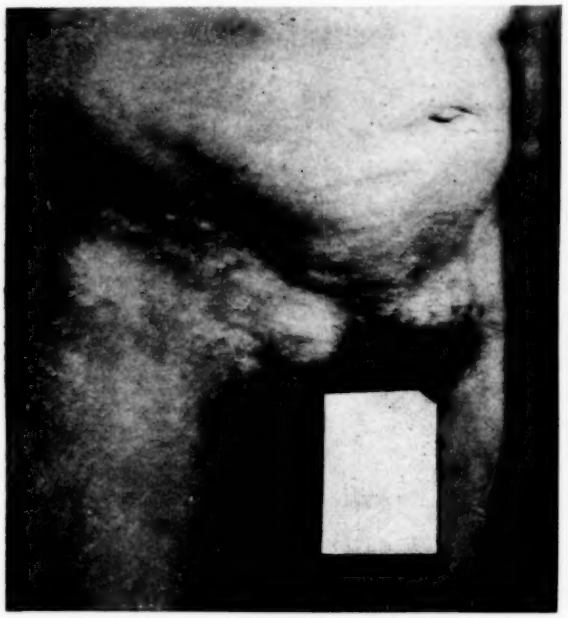

Fig. 5. Double direct inguinal hernia, illustrative of type for which living suture repair is indicated.

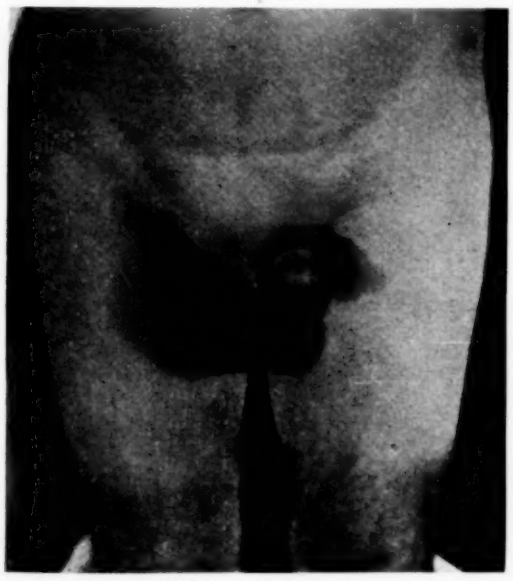

Fig. 7. Recurrent indirect inguinal hernia (scrotal), a type well suited to the living suture operation.

We feel that eighteen to twenty-one days in bed should be the rule for cases operated upon by the living suture method.

Fig. 6. Scrotal hernia of the type in which obliquity of the inguinal canal is largely lost and in which recurrence by the simpler methods of operation is likely to occur.

The course after operation has been on the whole no less satisfactory than in similar series of herniotomies by the more simple methods of repair. The longer duration of the operation has not resulted in an increase in pulmonary complications. Postoperative tympanites has occasion-

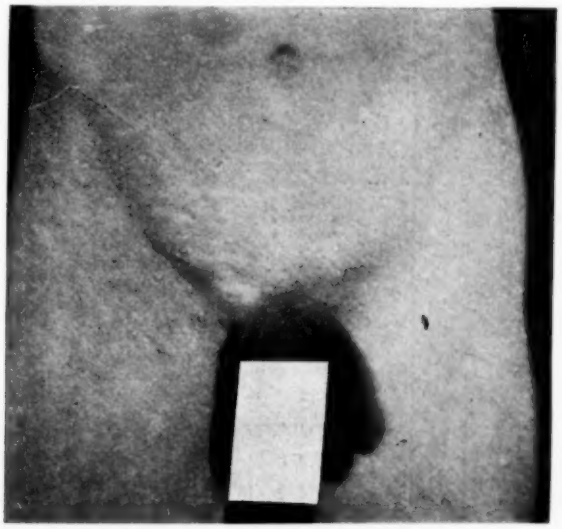

Fig. 8. Recurrent indirect inguinal hernia. Recurrence in this case had apparently followed the overlapping type of operation and took place at the internal ring.

No.	Sex	Age	Type of Hernia	Date of Operation	Infection	Other Complications	Period Followed	Result
1	M	28	RIIH-Rec.	5/ 6/25	Thigh wd.	None	19 months	Recurrence
2	M	49	LIIH-Rec.	7/ 9/25	.....	.....	8 months	Firm repair
3	M	58	DDIH-Rec.	6/ 3/25	Sup. left side	.....	15 months	Firm repair both sides
4	M	35	LIIH (Scrotal)	6/17/25	.....	Phlebitis rt. leg	6 months	Firm repair
5	M	51	LDIH-RIIH	5/ 1/25	.....	.....	7 months	Firm repair both sides
6	M	48	DIIH-Rec.	12/12/24 L. 1/26/25 R.	.....	.....	11 months	Firm repair both sides
7	M	52	LDIH	1/10/25	Deep	.....	2 months	Firm repair
8	M	48	DDIH	10/27/24	Sup. rt. side	.....	1 month	Firm repair
9	M	23	LDIH-Rec.	5/24/24	.....	.....	7 months	Firm repair
10	M	58	RDIH-Rec.	6/ 2/24	.....	.....	0	?
11	M	32	RDIH	10/25/24	.....	.....	0	?
12	M	47	RDIH	10/25/24	.....	.....	3 months	Firm repair
13	M	28	VH	6/ 6/25	.....	.....	0	?
14	M	51	DDIH	6/18/25	.....	Peripheral neuritis rt. hand	17 months	Firm repair
15	M	42	VH	4/ 8/25	Deep—Sutures sloughed	.....	0	Recurrence
16	M	38	DDIH-Rec.	5/13/25	.....	.....	0	?
17	M	39	VH	1/26/25	Deep with slough part of suture	Wd. healed in 43 days	21 months	Firm repair
18	M	34	RIIH	8/21/25	.....	.....	7 months	Firm repair
19	M	52	LDIH-Rec.	7/23/24	Deep with slough part of suture	.....	0	?
20	M	68	LDIH-Rec.	1/23/25	Deep slough of some of sutures	.....	18 months	Diffuse bulge classified as recurrence
21	M	27	DDIH-UH	1/ 3/25	.....	.....	4 months	Firm repair all three hernias
22	M	55	RDIH	7/30/25	.....	... .	10 months	Firm repair
23	F	55	UH	5/ 9/24	.....	.....	0	?
24	M	57	RDIH	2/12/25	.....	.....	13 months	Firm repair
25	M	37	DDIH	6/13/25	.....	.....	0	?
26	M	33	RJIH-Rec.	11/14/25	.....	.....	1? months	Recurrence
27	M	57	LIIH	12/ 9/25	Wd. infected	.....	0	?
28	M	42	DDIH	1/ 1/26	.....	.....	0	?
29	M	39	RJIH-Rec.	2/10/26	.....	.....	2 months	Firm repair
30	M	68	RIIH-Rec. Scrotal	7/ 2/26	Deep with sloughing sutures	Prostatic obstruction, chronic bronchitis	3 months	Recurrence
31	M	31	VH	6/ 8/26	Infected hematoma	.....	3 months	Firm repair
32	M	59	DIIH	5/16/26	.....	.....	5 months	Firm repair on left Right recurrence
33	F	56	VH	6/14/26	Infected hematoma	Vomiting and fever	2 weeks	Firm repair
34	M	54	RJIH-Rec.	5/18/26	.....	.....	4 months	Firm repair
35	F	53	VH	6/21/26	Deep but low grade noted on 19th day	.....	2 months	Firm repair. Slight serous discharge from sinus
36	M	32	LIIH-Rec.	6/23/26	Small hematoma	.....	0	?
37	M	56	RIIH-Scrotal	7/17/26	.....	Lobar pneumonia	.....	Died 7th day postoperative
38	M	45	LIIH-Rec.	6/26/26	Superficial	.....	4 months	Firm repair
39	M	31	RDIH-Rec. Incarcerated	8/12/26	.....	.....	0	?
40	M	28	RIIH-Rec.	8/19/26	.....	.....	2 months	Firm repair
41	M	26	RIIH	8/19/26	.....	.....	2 months	Firm repair
42	M	48	RIIH	9/ 6/24	.....	.....	18 months	Firm repair

No.	Sex	Age	Type of Hernia	Date of Operation	Infection	Other Complications	Period Followed	Result
43	M	58	UH	2/ 3/25	.....	.....	0	?
44	M	50	RIIH	3/11/25	.....	.....	0	?
45	M	46	LIIH-Rec. RIIH	8/24/25	.....	.....	14 months	Firm repair both sides
46	F	43	VH	11/13/25	.....	.....	0	?
47	M	36	LDIH-Rec. RDIH	1/11/26	.....	.....	0	?
48	M	28	LDIH-Rec.	3/31/26	.....	.....	6 months	Firm repair
49	F	55	LIIH	6/ 1/25	.....	.....	16 months	Firm repair
50	M	52	LDIH-Rec.	5/16/25	.....	.....	16 months	Firm repair

ally been troublesome, but has yielded to the prompt use of the customary measures taken to combat it. Wound infection has been a complication in fourteen cases, ranging in severity from stitch abscess to complete infection of the deeper layers of the repair. We feel that this is a most important cause of failure to effect a cure. In some cases the sutures sloughed out in part and were discharged from the wound. It should be stated that these patients were operated upon in an operating room used daily for every form of general and genitourinary surgery with a liberal percentage of virulent pus cases. It is our belief that the percentage of clean cases of various sorts that develop wound infection is higher than obtains in operating rooms that are used exclusively for non-infected surgical cases. However, it is also our belief that the Gallie procedure is more apt to be followed by wound infection than the simpler hernioplasties, and that the presence of free fascial grafts is one of the factors in the increased liability to infection. The more frequent occurrence of hematoma is undoubtedly another important factor in the series of cases under consideration. There were fourteen infections of the hernia wound, or 22.4 per cent. In a series of 500 simple consecutive herniotomies performed on the Second Surgical Division of Bellevue Hospital, whose records were studied for comparison, there were 64 infections (12.8 per cent) of all degrees, ranging from simple stitch abscesses to infections of the superficial and deep layers.

The average age of the 50 cases in this series was 44.7 years. Twenty-one cases were fifty or over, and two were sixty-eight years old. The youngest patient was twenty-three. The age of this group of cases is a full decade above that of the average hernia case operated upon in the Adult Service; this conforms to the later onset of direct hernia, and to the time of life when relaxation of the muscles and fatty infiltration of the tissues make the subject a poor prospect for cure by the simpler methods of operation. The added risk of a major operative procedure in the older individual is reflected in the mortality rate of one in 50 cases, or 2 per cent.

Sex. There were 45 males and 5 females in this series; the females were operated upon for umbilical hernia (1 case) and postoperative ventral hernia (3 cases), and inguinal hernia (1 case). It should be noted that recurrent hernia, the indication par excellence for this operation, is quite infrequent in the female, while direct hernia is very rare.

Types of Hernia. The following is a classification of the 50 cases with 63 hernias:

Type	No. of Hernias	No. of Recurrences
Recurrent inguinal.....	24	4
Direct inguinal (including saddlebag)	18	0
Indirect inguinal.....	11	1
Ventral (postoperative).....	7	1
Umbilical.....	3	0

Results. Excluding the case that died, we have 62 hernias in 49 cases for con-

sideration. There were 28 hernias in 23 cases which must be excluded either because they are not traced at all, or traced for less than th ee months, or are too recent to have had sufficient time elapse in which to estimate the result. Of the remaining 34 hernias in 26 cases, all of which have been examined at a period of at least three months after operation, the grouping according to duration of time followed is:

	Cases	Hernias
Over 3 months but under 6 months	7	10
Over 6 months but under 9 months	6	7
Over 9 months but under 12 months	3	4
Over 12 months but under 18 months	6	9
18 months or longer	4	4
Total	26	34

Fig. 9. Needle holder and needles used for fascial sutures

There were six recurrences in this series. Basing the recurrence rate only on the 34 hernias followed up, the percentage of recurrence is 17.9, while if the 10 hernias traced from three to six months are excluded, the results being based on 24 hernias traced six months or more, the rate is 25 per cent.

Seward Erdman, reporting from the New York Hospital upon the results of 52 traced operations for recurrent inguinal hernia, states that there were twelve secondary recurrences, or 23.1 per cent. In our series, there were 24 recurrent hernias with four recurrences, or 16.6 per cent; of these, fifteen were followed, which gives a recurrence rate of 26.6 per cent. It is our hope that continued efforts to recall those recurrent cases of which we have no follow-up notes, or those too recent to have fulfilled the requisite elapsed time, will result in a diminution in the percentage of secondary recurrences.

By "follow-up" cases we mean those that have returned to the hospital for examination by the several members of the attending staff and not only by the operator. Letters from patients are not accepted by us as proof of their cure.

We realize that the three months minimum period is far too brief to designate the end results as permanent and even these represent a discouragingly small percentage of the total number of cases operated upon, despite the fact that a careful follow-up clinic is maintained to which all patients leaving our service are instructed to return for periodic re-examination. Moreover, letters are sent to all who fail to return and no case is closed until three notifications have been sent without response. Ignorance, indifference and frequent change of address are characteristics of the floating population

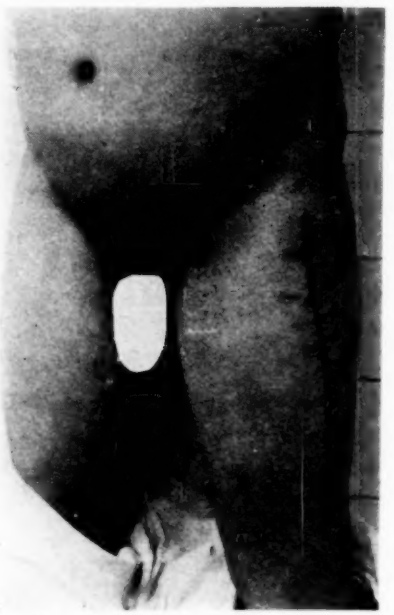

Fig. 10. Incisions (retouched).

from which our material is drawn and contribute to reduce the effectiveness of our recall system.

Analysis of Recurrence. Of the six recurrences noted in this series, four were in recurrent hernias, and three followed severe postoperative wound infection with sloughing of sutures.

We feel that the relatively high percentage of recurrence after the living suture operation, as shown in this series, should not be construed to mean that the

method is not productive of better results than the simpler, time-honored methods. Comparative statistics should be based on analogous groups of cases. This series of cases represents those (selected from a group of 400 hernias) which, in the judgment of the various operators, were poor prospects for cure by any other method. If the living suture operation is reserved for admittedly difficult hernias, statistical figures will always be misleading if compared with those obtained by simpler procedures on relatively easily curable hernias. The excellent results by almost any method applied to the cure of indirect hernia in children corroborate this.

Mortality. There was one death, a mortality rate of 2 per cent. This patient was a male of fifty-six who succumbed on the seventh postoperative day of a rapidly developing postoperative pneumonia complicated by cardiac failure. In the 500 cases operated upon previous to the use of the living suture, there were three deaths, or 0.6 per cent.

Summary

(1) A series of fifty patients with sixty-three hernias all operated upon by living suture method is reported from the Second Surgical (Cornell) Division of Bellevue Hospital.

(2) The majority of these hernias were either direct, recurrent inguinal or ventral in type, and the age of this group averaged a decade above that of simple adult herniotomies.

(3) The operation as performed by us is described in full with illustrations.

(4) There were six recurrences in 34 traced hernias, the period of observation ranging from three to twenty-one months.

(5) Postoperative wound infection was a complicating factor in 14 cases and was undoubtedly responsible for three of the recurrences, but did not seem to affect the end result in the other 11 cases. The presence of fascial sutures renders

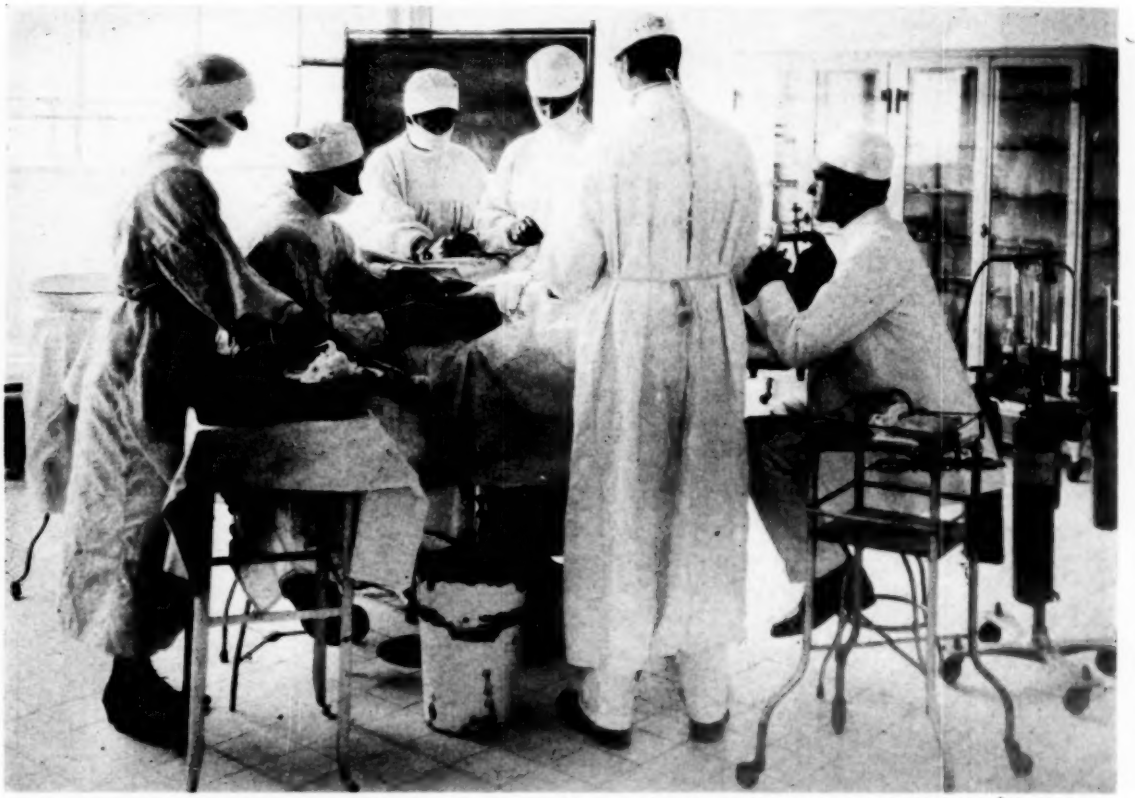

Fig. 11. Operating room set up for simultaneous operations upon hernia and upon thigh for removal of fascia

wound infection more likely to occur.

(6) Barring wound infection, the postoperative course does not differ materially from that observed in simple herniotomy.

Statistics show an apparent increase in mortality. Whether this would be maintained in a larger series of living suture operations is doubtful. Care should be taken in the selection of cases for this more prolonged operative procedure.

(7) The operation is indicated in recurrent inguinal hernia, direct inguinal hernia, and large scrotal hernia associated with poor musculature. It is a valuable aid in dealing with postoperative ventral and large umbilical hernia. We regard it as a major procedure and reserve it for cases in which we feel it is distinctly indicated. The results of the operation should be judged with due consideration to the type of complicated hernia upon which it was used.

In conclusion we wish to express our appreciation to Dr. Harold E. Santee, Director, Second Surgical Division, Bellevue Hospital, both for the opportunity of presenting this material and for helpful suggestions in its preparation, and to Dr. Harlan Heim for tabulating the statistics of the 500 cases operated upon prior to the use of living sutures.

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THE PETROUS PYRAMID

ITS SURGICAL ANATOMY AND THE TECHNIQUE OF THE OPERATION FOR ITS REMOVAL

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THE object of this paper is to present such data as have been secured by operating upon eight cases for the removal of the petrous pyramid either in whole or in part, and to discuss from a surgical standpoint certain anatomical features of the pyramid having a bearing upon the technique of the operation.

First, there was a group of three malignant cases (cancer) having as far as could be determined the middle ear as the original site of the lesion. Inasmuch as this group contributed no special features to the technique of the operation not embraced in the second or suppurative group but brief reference will be made to it. Generally speaking, these cases were characterized by excessive fetor, complete facial paralysis prior to operation, dead labyrinths functionally and an excessive tendency on the part of the bone to bleed during operation. In one of these the pyramid was traversed by numerous venous sluiceways of large size having no counterpart in the normal bone. These gave rise to excessive hemorrhage. All these cases succumbed, one having lived about two months after operation. In one of this group the disease had exposed the carotid artery throughout its course in the carotid canal, the vessel wall was involved, and the artery was accidentally injured in a manner to be referred to later. But for this accident to the carotid and such information as was obtained concerning carotid bleeding, this group contributed little additional to the technique of the operation. In all these cases the entire petrous was removed, no attempt being made to save any of its structure. The facial arch, the facial nerve and the integrity of the internal auditory meatus were sacrificed.

Second, there was a group of five suppurative cases in which the extensive necrosis of the petrous was consecutive to mastoid and labyrinth suppuration. All of these cases recovered.

Three of the five cases occurred in the chronic type of middle ear and mastoid disease, the necrotic process involving in these cases the cochleal shell, the inner cochleal wall and modiolus. In two of these the pus in the cochlea was of a distinct canary color, the pus in the internal meatuses being of the same color. In all these cases there was a collection of pus in the internal auditory meatus and at the posterior petrous plane. In none of these could a facial arch be preserved owing to the location of the necrosis, and in none was the extreme tip of the pyramid removed, due to the fact that it was not involved, and being of diploic structure it had a better opportunity through good nutrition to survive than would have been the case had the bone been pneumatic in type. In all these cases facial paralysis followed operation, this being a necessity when the bony internal meatus is sacrificed. One of these cases presented many of the clinical features of a diffuse leptomeningitis minus the mental disturbance of hebetude and drowsiness. There were moderate continuous fever, positive Koenig sign and stiff neck; the cerebrospinal fluid was milky and contained short-chain streptococci in numbers. The spinal fluid was tapped daily or every second day over a period of two weeks following operation, the milkiness and streptococcic chains gradually disappearing. To all appearances the case

was one of recovery from diffuse cerebrospinal leptomeningitis.

In the second group (suppurative) two occurred in the course of acute mastoiditis which had been more or less neglected and had passed into what we might call, for the sake of description, the subacute stage. In both, the petrous was pneumatic. In the first the bone was highly pneumatic and of exceptionally large size; in the second the petrous was extremely small with its relations cramped.

The portion of the petrous removed in the second case comprised all that part of the pyramid lying above the level of the tympanic floor and extending from the base to the apex of the bone. In the first the removal was the same with the exception that there was preserved for the facial nerve an arch of bone extending from the facial ridge across the main axis of the pyramid to the internal auditory meatus. The plane of this arch or bridge was more or less transverse to the petrous axis, the outer end or pier being represented by that portion of the facial ridge corresponding to the level of the tympanic floor, the inner end or pier by a vertical rectangular plate or portion of the posterior petrous plane. The base of this inner pier represented a portion of the inner rim of the dome of the jugular bulb; the top of it included the internal auditory meatus. This entire facial arch was undermined, the removed portion representing the body of the petrous pyramid at that level.

In both these cases there was associated with the necrotic petrous an epidural cerebellar abscess situated at the posterior petrous plane in the vicinity of the internal auditory meatus.

In the second case this abscess had obliterated the meatus and filled its canal with granulations so that upon removing the modiolus and the bony internal meatus which separated as a sequestrum, there was no loss of cerebrospinal fluid. The base of the abscess was formed by a thick mass of exuberant black granulations such as is met with in those sharply defined perisinus epidural abscesses of low infectivity where the sinus wall has had the opportunity through time to become enormously thickened.

In the first patient the abscess was adjacent to but had not encroached upon the internal meatus. Upon opening the vestibule in this case pus in quantity pulsated up through a perforation in the inner vestibular wall. The outer labyrinth wall was likewise perforated in the geometrical solid angle of the semicircular canal system. In this patient a large quantity of cerebrospinal fluid was lost through an accidental tear of the dura of the internal meatus.

The outstanding pathological feature in all these suppurative cases is the presence of a collection of pus at the posterior petrous plane either in the meatus or adjacent to it. In four the internal meatus was involved; in one it was not.

This epidural abscess situated at the posterior petrous plane deserves special recognition as a distinct clinical entity, not that it differs from epidural abscesses elsewhere but because of its surgical relation to the labyrinth, depending upon and having its origin in labyrinth infection. First, it is deep-seated, is liable to be overlooked or not looked for, has little or no chance of evacuating itself by traveling outward along the posterior petrous plane there perforating and revealing itself. It is silent in its manifestations if we expect headache, and it does not announce its presence through symptoms peculiar to itself. If overlooked it must result in death.

The first case of this group shows conclusively that the abscess may result from direct perforation by a suppurative process of the inner labyrinth wall. The other four cases point to the cochlea as the focus of infection and the modiolus as the path of infection.

Let us now turn to the modiolus and examine it as an avenue of infection to the intracranial cavity. First, it is a canalized pyramid of bone traversed from base to

apex by numerous soft structures which, as they reach the bony spiral shelf, are radiated out into the interior of the cochlea and there become immersed in labyrinth fluid. Infection may readily travel from without inward by contiguity along these structures to the interior.

Second, the modiolus stands in intimate relation not only to the labyrinth fluid but to the cerebrospinal fluid also. It is a porous structure with each end, so to speak, immersed in fluid.

Third, the cerebrospinal fluid penetrates out into the modiolus along the canals carrying the soft structures. This can be demonstrated in the living subject by gradually lowering the pyramid from its apex toward its base; a point is reached before the internal meatus is actually opened when there occurs a seepage of cerebrospinal fluid through the modiolus stump. This point lies above the level of the first cochleal whorl.

The act of respiration produces a movement in the fluid column of the cerebrospinal axis, causing it to ebb and flow, and I should like to consider briefly this influence as a possible factor in the spread of infection from the cochlea through the modiolus of the intracranial cavity. Let me mention a few facts to show how far reaching in its influence the act of respiration is upon the fluids and cavities of the body.

We see during this operation the effect of respiration upon such a cavity as the temporomaxillary joint when its capsule is exposed. Its effect upon the great cavities of the thorax and abdomen are well known, the tissues of the neck themselves aspirate. I have often noticed an infiltration of air resembling frog spawn beneath the deep cervical fascia when that structure has been nicked by accident in the jugular resection. The fluid columns of the great veins aspirate; the jugular in the neck is milked completely dry at each inspiration when its volume of blood has been diminished by thrombosis of the sigmoid above. We all have seen the sigmoid sinus aspirate, and to make manifest this unseen force, which is forever active, it is only necessary to diminish through pressure with the finger upon the lateral sinus the volume of its current. I have seen the lateral sinus aspirate even after the sigmoid below it had been opened and blocked, aspiration having taken place through the jugular and the lateral sinus of the opposite side as was proved by the fact that pressure upon the opposite jugular caused a cessation of the phenomenon. I have also seen the mastoid emissary vein aspirate. Just as pulsation is transmitted to the remotest arterioles so this influence is carried to the minutest veins.

No doubt the very fluids in the tissues of the body are affected by this moving force of respiration which is complementary in its action to the driving force of the great arterial system with its elastic contractile coat. The fluid column of the cerebrospinal axis aspirates and moves with respiration; it pulsates also. This dual movement may be observed in the internal auditory meatus when the fluid column of the internal meatus has been exposed by destruction of the modiolus. The time for observation is when the fluid column of the meatus is in a condition of equilibrium and just presenting in the meatal opening.

This movement of the fluid to and fro in the internal meatus must exert a rhythmic suction upon the fluid penetrating the modiolus and through this porous pyramid create an interchange between the fluids of the labyrinth and the fluid of the cerebellar fossa. Certainly the factors necessary to such an interchange are present.

Just how gross this interchange is I do not know but a practical experiment could be carried out along the lines of staining the labyrinth fluid and making hourly examinations of the fluid of the internal auditory meatus to determine at what rate such an interchange takes place.

From a surgical standpoint and for the reasons I have stated I regard the modiolus as a bony sieve interposed between the labyrinth and intracranial fluids allowing a slow interchange between the two. A gross

interchange does not occur. The act of respiration through its influence upon the fluid column of the cerebrospinal axis plays a rôle in the dissemination of infection from the cochleal to the intracranial cavity and the opening of a normal labyrinth is the surgical equivalent of opening the subdural space.

The modiolus as an avenue for the distribution of infection to the interior of the skull is the most important structure of the labyrinth and in relation to the surgical pathology of this region it outranks all others. The cochlea is the great distributing focus.

We would surmise this on histological grounds and the frequent occurrence of pus in the internal meatus and at the posterior petrous plane in these suppurative cases adds its clinical support. There are certain factors that may simplify or complicate the operation, among which the following may be noted:

First, the size and structure of the bone. A pneumatic pyramid of roomy proportions makes the operation more easy, a small pyramid with its relations cramped the reverse. It would have been impractical in the second case of the acute group to have attempted to save a facial arch even though we had the choice of doing so, on account of the time it would have been necessary to have sacrificed in the attempt in a pyramid of such small proportions.

Second, the degree to which the pyramid has been softened by the disease, thus enabling any easy exenteration.

Third, as to whether or not we attempt to save a facial arch for the facial nerve. The operation is made much more difficult technically if we elect to make this attempt. The extent and location of the necrosis decides this question for us.

Fourth, as to whether or not the internal auditory meatus is obliterated. If it is, as in most of the suppurative cases, the operation is very materially simplified.

Fifth, as to whether or not there is a loss of cerebrospinal fluid, either through injury to the dura of the cerebellum or injury of the internal meatus or modiolus. If the loss of fluid occurs, aside from its dangers it is a severe handicap.

The first step in the operation includes the mastoid, the radical, and the labyrinth exenteration. Perhaps it would be better to say that it is during the labyrinth exenteration that we first become aware of the necessity of having to remove the pyramid in its entirety.

One of the things demanded by this operation is room, that is, working space, and every effort should be made to secure this from the first. At the earliest possible moment we should come to a decision as to whether or not an attempt is to be made to preserve a facial arch. If so a considerable portion of petrous squama should be removed at once. This allows the dura of the temporosphenoidal lobe to be lifted so that the arch which is to include the facial nerve may be outlined, and it allows of work being done over this arch down upon the deep apical portion of the pyramid.

All work upon the apex (when the arch and internal meatus are preserved) must be done in a relatively small space, that is, through a triangular opening with the dura above the facial arch below, the modiolus internally and the convexity of the anterior wall of the auditory meatus externally. The convexity of the anterior wall of the external auditory meatus is a considerable hindrance to us and it might be thought that by sacrificing it we could gain room. This, however, fails of its purpose inasmuch as the capsule of the jaw joint makes a distinct excursion during the act of respiration and keeps alternately projecting into and retreating from the operative cavity, which is very annoying to the operator. It is much better to shave down the convexity of the anterior canal wall to the utmost but not to expose the capsule of the joint.

If the structural character and degree of necrosis permit, I think it is better to first exenterate the petrous and later remove its shell; otherwise the dura of the

posterior and middle fossae bulge into the wound, constrict the operative field, which is extremely deep, and close it to successful view. Retraction of these structures is then necessary but the best retractor is the shell of the petrous pyramid as it commits no trauma, occupies no space and is accurately applied to the surfaces to be supported.

A second reason for first exenterating the petrous is that the dura enclosing the superior petrosal sinus is firmly attached to the upper margin of the posterior aspect of the pyramid and separates with difficulty from its uneven lip. In consequence the vessel may be torn and a hemorrhage which is difficult to control may follow, for it is not easy to place a compression plug between the dura and the bone as the two do not readily separate. If this accident to the superior petrosal is to occur, it is more convenient to have it occur toward the end of the procedure.

By first exenterating the petrous we render the operative field relatively clean. If then we lose cerebrospinal fluid through accidental injury the danger of infection is not quite so great. In removing the main body of the petrous the chiseling should be done, as a rule, in a direction that parallels the petrous axis. To facilitate this we should remove the bone covering the vertical limb of the sigmoid sinus from the knee down and continue the removal of bone backward over the lateral aspect of the cerebellum for a distance sufficient for our purpose.

In separating the cerebellar dura from the posterior petrous plane we are liable to tear this membrane. This accident may occur in Trautman's triangle before we have reached the level of the semicircular canal system but we are more liable to this injury the deeper in we proceed toward the apex. It is an unfortunate accident and is attended by danger. I have seen meningitis in three instances follow as a result of it. Nor is it an accident that it is always possible to avoid because the posterior aspect of the pyramid, as we pass from without inward, presents increasing irregularities of contour which enhance firm dural attachment. Now and then are to be seen jutting from the posterior aspect of the bone little sharp flat spicules to which the dura is firmly anchored or over which strands of dura pass. From these spicules these dural strands separate with difficulty.

When the tear in the dura occurs it generally takes place along a line parallel to the petrous axis. It may be a thread-like slit quite invisible except at such times as cerebrospinal fluid is escaping. To avoid this accident it is safer to separate the dura from above downward and from within outward rather than from without inward, for reasons to be mentioned later.

The feature that renders this injury peculiarly dangerous is that the rent in the dura may not close for weeks. I have seen it persist for three weeks after this accident during which time the cerebrospinal fluid leaks intermittently into the operative cavity and the subdural space is open to its infection. The following factors are to be considered in relation to this injury:

The cerebellar dura of this region as compared to the temporosphenoidal dura in this operative area is more tightly stretched. It does not sag forward, nor permit the same degree of bulging of the encephalon into the rent and the sealing off of the subdural space.

The cerebellar mass is better cushioned from its corresponding dural surface by cerebrospinal fluid than is the temporosphenoidal mass and its position is less favorable to a closure.

Following this injury there may occur for hours a continuous leakage of cerebrospinal fluid sufficient to keep the dressings and bandage wet. Then follows a period of cessation, a period of no flow, during which time the cerebellar mass may block the opening in the dura; but this is only temporary. Later it is floated away by the reaccumulation of cerebrospinal fluid and then follows a period of releakage. This cycle of leakage, closure, and releakage is

very characteristic of injuries to the cerebellar dura of this region. It does not occur in similar injuries to the temporosphenoidal dura; here a bud of encephalon pouts into the wound and quickly, and as a rule permanently, seals off the subdural space.

During this entire period of non-closure the act of respiration through its influence upon the cerebrospinal fluid column, causing it to ebb and flow, must contribute materially to the dissemination of infection to the interior. In fact, there occurs in this injury the same sequence of phenomena that may be observed upon the shore of any lake, the cerebrospinal fluid column representing the body of water, the tear in the dura the shore line, the act of respiration the moving force which impels the water to and fro, the infection of the operative cavity the drift which is sucked back to contaminate the interior.

Where the attempt is made to preserve a facial arch our aim should be to leave this arch, for the sake of nutrition, as thick as possible, not only at its bases but throughout. If necrosis has so involved the arch that it is imperative to thin the bridge down to a minimum, we incur the risk of an exceedingly irritating accident, namely the fracture of the Fallopian canal. When this accident occurs a section of the arch becomes a detached fragment of bone with the nerve running through it, that is, an annulus which may be slid up and down on the nerve just as a ring on the finger. The part most liable to this accident embraces that portion of the Fallopian canal just above and behind the oval window. Here the contour of the canal is semi-exposed. It is exceedingly thin and sclerotic at this point and the canal is crossed by planes of cleavage which are constant. It is the unexpected fracture of the bone along these planes which results in the accident. By making the stroke of the chisel parallel to the central axis of the pyramid and by placing the point of the stroke successively inward so as to approximate nearer and nearer its central axis, it may be shown that the bone cleaves along planes which emerge further and further forward on the inner tympanic wall, that is, higher and higher up toward the apex of the pyramid. This is but another way of stating that the anterior aspect or face of the petrous shell is shingled; and this conception of the structural character of the shell is extremely important in its relation to our technique when attempting to preserve the facial arch.

When confronted by this accident the problem is how to remove the annulus without injuring the nerve. As I have had to deal with this accident in the living let me cite a few of the mechanical difficulties which will better enable the reader to visualize the problem.

First, the facial nerve is an exceedingly soft structure; it may readily be mashed between the thumb and finger. Under the conditions of the accident it is suspended at each exposed end from a rigid bony canal with sharp cutting edges, and this allows of no lateral displacement of the fragment, in fact no displacment in any direction without injury.

This makes it imperative that the little ring of bone surrounding the nerve be held absolutely firm and rigid during any attempt to remove it. There must be no jiggling of the fragment, no shaking. To avoid shaking, a fulcrum for the crushing instrument is necessary and only one hand can be dedicated to that instrument.

Again, the little annulus cannot be crushed by any instrument whose action is transverse to the course of the nerve as there are no points of appliance. Its action must be tangential to and in the long axis of the nerve. Whatever instrument is used it must secure its grip upon the ends of the annulus and likewise this holds true for the grasping instrument that steadies the fragment. Both instruments must work in the same plane. These conditions in a cramped space impose a severe handicap.

A thin thumb forceps with the ends drawn almost to points and rigid enough to keep

accurate approximation under pressure is one necessity. A straight rongeur with small beak and small cutting cups evenly apposed, I have found to be a serviceable instrument.

I think an instrument could be devised that would better meet the mechanical conditions, namely one with a straight rongeur handle with cutting blades instead of cutting cups and with which a longitudinal section could be split from the annulus through which the nerve could be released. Such an instrument would not be unlike certain types of nail clippers on the market.

This little annulus will tax the ingenuity of any operator to deal with it and at the same time leave the nerve uninjured.

Generally speaking, when attempting to carve out a facial arch all work should be done in a plane perpendicular to the petrous axis and a thin sharp chisel is the instrument of preference.

Let us now return to the modiolus and consider a few features of its surgical anatomy, for it is a treacherous structure and in this operation is always liable to injury.

As generally thought of and described, the modiolus is a pyramid. This description carries with it the inference that it decreases gradually in size from base to apex. Surgically this conception is erroneous and may result in disaster. In fact, one of my earlier labyrinth cases lost his life through my failure to appreciate the true character of the modiolus.

The modiolus more nearly represents a section of a cylinder than a pyramid, the outer end being slightly smaller than the inner. Upon the cochleal end of the cylinder is a slight and surgically unimportant little spicule of bone. The inner end or base of the cylinder is somewhat excavated and its marginal rim is seated circularly upon the outer end of the internal auditory meatus. The cylinder lies prone and juts out centrally into the cochleal cavity. Under the conception that the modiolus is a pyramid it might be thought that it could be gradually lowered with safety from its apex to its base. While its apex is its weakest point the next weakest point is not just below the apex but at the extreme base. Should a stroke be made with the chisel at a point just below the apex with the idea of lowering the pyramid to gain freer access to the anterior portion of the cochleal cavity the modiolus fractures not at the point of the stroke but at its extreme base, and it fractures as one piece. The internal auditory meatus in consequence is opened across its entire diameter and there follows immediately a sudden and copious discharge of cerebrospinal fluid into the operative cavity sufficient to fill it in a few moments. This flow is impossible to control. The fluid is of low gravity and does not coagulate. Gauze packing does not stop it, wax may do so, but as a rule does not. The flow ceases only when a sufficient amount of intracranial fluid has been lost to establish equilibrium. This may take a considerable time, in fact hours. This accident is an absolute hindrance to further operative procedure aside from the danger it imposes.

The operator is particularly liable to this accident when opening the cochleal shell for it must be remembered that the modiolus sticks up like a little tentpole in the center of the cochleal cavity. One is apt to commit this injury with a curette. This is the most dangerous of all instruments in cochleal work and should not be used inasmuch as when using it the operator unconsciously seeks some point as a fulcrum and the modiolus from its position can scarcely escape being that point.

Also when operating upon the apex of the pyramid just anterior to the cochleal shell great care must be taken to let no instrument press upon the modiolus. This is not as easy to avoid as one might think, particularly if the petrous is a small one with cramped relations. The actual distance between the modiolus and the wall of the external auditory meatus is

very slight indeed, and we are required to work through this space. When in addition we must work over a facial arch which is fragile, beneath the lifted dura of the temporosphenoidal lobe, down into a deep cavity with the carotid at its bottom, and there remove portions of bone that are sclerotic and attached to the cerebellar dura, we get some conception of the difficulties encountered. I know of no situation in otologic surgery that is comparable to it.

As a result of the fracture of the modiolus and the opening of the internal auditory meatus with the loss of intracranial fluid there may follow a train of symptoms that has been described previously in a paper on the labyrinth but to which I shall refer again. With the too rapid drainage of the cerebellar fossa there may appear a small, rapid, irregular pulse, embarrassed respiration, which may assume a Cheyne-Stokes character, an anxious concerned expression, cold extremities, pinched livid features and marked restlessness. These symptoms may be of such an alarming character that death seems imminent but with the lessening of the escape of the cerebrospinal fluid the whole picture may in the course of a few hours so completely change that the patient appears quite normal. These symptoms are undoubtedly due to a too rapid drainage of the water-bed of the brain whereby the important nerve centers at the base, having lost their elastic support, sink and are brought in undue contact with the floor of the skull. The quick disappearance of these symptoms upon the cessation of the escape of cerebrospinal fluid forbids any other than a mechanical interpretation of these phenomena.

This train of symptoms is more apt to follow an injury to the internal meatus or modiolus where the flow is rapid than from an injury to the cerebellar dura. The freedom with which the fluid escapes after injury to the modiolus, taken in conjunction with certain anatomical features of the internal meatus, such as its non-collapsibility, its position relative to the floor of the cerebellar fossa and the contained fluid, and its being the avenue along which infection has frequently traveled, suggest its utilization as a drain to the cerebellar fossa in cases of purulent meningitis of labyrinth origin. For a good many years I have utilized the meatus in this way and while I have not succeeded in having a case recover through this measure, the distressing picture of a progressive meningitis has often been so ameliorated through the relief of intracranial pressure that the patient has passed from the condition of coma into that of perfect consciousness and remained so for weeks, even as the purulent meningitis progressed.

By far the safest and most practical instrument to use in this operation is the chisel held parallel to the petrous axis. It is dangerous to attempt to remove sclerotic portions of the pyramid with the rongeur, for by the sudden snapping of its jaws sharp slivers of bone may be driven through the dura. I have seen this accident occur. The manner in which the sclerotic portions of the pyramid fracture or separate when attacked with a rongeur is incalculable. The bone may fracture or cleave along a plane that extends far beyond the bite of the forceps.

For this reason, the dura adjacent to the pyramid should always be well separated before any attempt is made to remove any portion of the petrous shell. Otherwise we get splinters of bone which, while detached from the pyramid, are still attached to the dura and this is particularly liable to result in a dural tear. It was in this way that the carotid artery which I have previously referred to was injured.

The technique of any operation for the removal of the petrous pyramid to be successful must embrace in its conception something more than the mere ability of the operator to carve out a facial arch, avoid the internal meatus and remove such portions of the pyramid as are diseased or dead. It must take into consideration the

structural character of the pyramid, the nutrition of the bone and the nutritional changes that may take place subsequently in portions of healthy bone allowed to remain.

I wish to discuss briefly the structural character of the petrous pyramid from a surgical standpoint. A familiarity with the structure of the pyramid is absolutely essential to the operator and can be acquired only through cadaver work.

First, if the cutting edge of a chisel is held parallel to either petrous plane, the superior or the posterior, and the stroke is delivered in the axis of the pyramid we may sliver the bone in the corresponding plane.

Second, if in removing the petrous shell we place the cutting edge of the chisel at its base and make the stroke parallel to the petrous axis, maintaining the cutting edge of the chisel parallel to either plane, the bone will not only sliver along that plane but this plane of cleavage will emerge upon or cut the corresponding face of the pyramid at a point considerably deeper in toward the apex than the point of application. In other words, the petrous pyramid is shingled. Each face of it is shingled and it is shingled in the reverse order of a roof. It is the emergence of these planes upon the posterior face of the pyramid that gives to the posterior surface those little spicules and points to which the dura may be attached and the separation from which may produce the dural tear previously discussed. It is for this reason that in separating the dura from the posterior petrous plane the separation is more safely done by working from above downward and from within outward.

Surgically we should think of the pyramid as being formed by the successive overlapping of plates or scales laid down in order, from apex to base. It is as if each plate when laid had slipped slightly outward so as to expose its predecessor. It would follow, then, as a natural inference if we accept this idea of the structural character of the petrous, that the nutritional vessels distribute themselves along planes that correspond to the planes of cleavage; that is, the nutritional planes and the planes of cleavage are coincident.

The petrous pyramid appears to be built up much in the same manner as stratified rock, each leaf in the latter being due to sedimentary deposit from an overlying sheet of water; in the former, each scale of bone to bone deposit from an adjacent or overlying nutritional plane.

This arrangement of the nutritional plane relative to the bony structure of the pyramid would, I think, explain the phenomenon of scaling which is to be observed after extensive operation upon the sclerotic labyrinth. Subsequent to operation, it may be weeks afterward, we notice that a portion of the sclerotic structure, which we regarded as normal and healthy at the time of operation, dies. The disorganization of structure does not take place by the ordinary process of caries, the bone dies in scales; and the death of bone is more certain to occur if a mass of it rises as a prominence above the general plane of bone removal. It would appear that if a nutritional plane is intersected or cut, the bone external to it is not only apt to die but to separate in one piece as a scale along a plane of cleavage.

If we accept this view of the structural character of the sclerotic portion of the pyramid it will have a profound bearing upon the technique of the operation. For instance, the first question to present itself would be, is it safe to attempt to save a facial arch? May the arch not die subsequently by having its nutrition interfered with. That a healthy arch may die I can vouch for. If it should die would not the nerve fare worse than if the arch were sacrificed at the time of operation and the nerve abandoned to scar tissue? No doubt it would, for in those cases where this was done and the nerve exposed throughout its course across the pyramid and abandoned to a new environment of blood clot and subsequent scar tissue the paralysis

in these cases, while permanent, has by no means been complete.

That an arch may live even in a highly pneumatic bone the first case illustrates. While the limited number of cases we have had does not entitle us as yet to an opinion, my impression is that a longer experience will prove that it is not wise to attempt to preserve a facial arch in a bone of a highly pneumatic type even though the bone corresponding to the arch is sound. If the attempt is made the wound should be allowed to fill with blood clot so as to give the maximum nutritional conditions.

Again, if upon removing the main body of the petrous above the level of the tympanic floor we find as we approach the apex, that the portion of the apex lying above the general plane of bone removal looks healthy should we leave it? My belief is that we should not but should continue the removal of the petrous shell to the extreme apex of the pyramid along the general plane of bone removal, destroying all bone above that level, except in those cases where the apex of the pyramid is of diploic structure.

In the first group of suppurative cases the extreme tip was left in each case with success as the bone in each instance was diploic.

Surgically, we should think of the temporal bone as possessing two tips: one the mastoid tip placed vertically, the other the petrous tip or apex lying horizontally. Years ago it was recognized as a mistake to leave the exenterated mastoid tip as a thin shell; it too often underwent necrosis and necessitated reoperation. Its routine removal has been incorporated as a sound principle in mastoid surgery. More liberty may be taken in leaving a mastoid tip of diploic character, and I think the same general conditions hold true of the petrous apex, with this difference, that should the shell of a pneumatic petrous apex die subsequent to operation reoperation would be practically impossible and a fatal result would in all probability ensue.

Let us now take up the carotid artery for consideration. The carotid is more frequently exposed through erosion of its canal in chronic suppurative middle ear disease than is generally supposed. When thus laid bare the vessel shows no visible pulsation. If a thin layer of blood is allowed to collect upon it, serving as a mirror, the light reflex thrown back reveals a faint but scarcely noticeable pulsation; it requires close scrutiny to observe it. Within its canal the artery has suddenly become converted into a vein; its wall is no thicker than that of the sigmoid sinus; its middle coat is lacking or undeveloped; there is no necessity for its development as the canal gives the necessary support. The outer wall of the artery is but loosely attached through small filaments to the interior of its canal and is readily dimpled away with a cotton applicator. Its attachment to its canal is not nearly so treacherous as is that of the sigmoid sinus at the sinus knee.

The carotid canal serves a twofold purpose. First, as the exposed artery shows no visible pulsation, it is evident that the carotid canal acts as a bumper to the pulse wave receiving its impact and shielding the brain from excessive shock.

Second, as the canal is rigid and does not permit the artery to dilate, it has the practical effect of constricting that portion of the artery within its grasp. The effect is the same as when with the fingers we constrict the lumen of a rubber tube through which water is being forced by a rubber bulb; that is, there is the tendency under these conditions for the intermittent or remittent current to approximate a continuous stream. The carotid canal, therefore, not only protects the brain from pulse impact but it is a mechanism by which the inflow of blood to the brain is regulated and made more even and continuous.

It is the complementary arrangement on the arterial side of the circulation to the goose-neck mechanism of the sigmoid sinus, the jugular bulb and the collapsible jugular vein on the venous side of the

circulation whereby aspiration of the great sinuses of the skull is modified and an even outflow of blood from the brain is guaranteed.

In the malignant case, where the carotid artery had been exposed throughout its course in the carotid canal and the artery was accidentally injured, the first thing to attract my attention was that the bleeding was essentially venous in character. There was an even continuous flow of blood from the vessel similar in every respect to that from an injured lateral sinus. There was no pulsation to the stream, no spurting of blood to indicate that the current was under any considerable degree of variable pressure, in fact, quite the contrary. I was struck by the apparent sluggishness of the flow. A similar injury to the wall of the lateral sinus would have resulted in much greater bleeding, not merely in volume but in vigor. The current of the sigmoid and lateral sinus is a much busier stream than that of the carotid artery in the carotid canal, and gives the impression that it is actually under greater pressure. One thing is certain, the carotid canal stills the pulsating column of blood before it is passed on to the brain. This had been surmised some years ago.

The bleeding from the artery was readily stopped with very little pressure and much more easily controlled than bleeding from a similar injury to the sigmoid sinus. One factor that possibly contributed to the ease with which the bleeding was controlled was that the artery was exposed throughout its entire diameter and over a considerable distance. I think an injury to a semi-exposed artery would have been more difficult to handle. There would be no chance under such circumstances to enlarge the exposure by bone removal, thereby gaining better advantages for the application of pressure. Under such conditions, were the bleeding from the vessel of the ordinary arterial character I am sure that the hemorrhage would dissect away the artery from its canal and that there would follow a most extensive extravasation of blood all along the course of the vessel, both above into the intracranial cavity and below into the neck. But in the actual case, while no autopsy was obtained there was no evidence whatever that this had occurred even in the slightest degree. This patient lived but a few days after operation but there was no further hemorrhage from the vessel.

I see no reason why an uninfected clot should not undergo organization just as readily in the artery as in the sigmoid sinus, for the carotid artery in the carotid canal has the essential properties of a venous sinus with the exception that it carries arterial blood.

In view of the frequent exposure of the carotid artery through erosion of its canal in chronic middle ear suppuration it is surprising that this vessel is not frequently the seat of an infective thrombosis. I have never met with such a case but the factors necessary to its occurrence are often present.

A point of interest occurs in connection with the eyes in these cases where the extreme tip of the petrous pyramid is removed. Upon emergence from anesthesia both pupils may be dilated ad maximum as if atropine had been instilled. This dilatation in the first case continued for several weeks, gradually subsiding. In a second case the pupil corresponding to the side of operation was considerably dilated over its fellow though not ad maximum; six weeks subsequent to operation this pupil still showed moderate dilatation. In each case the pupils reacted to both accommodation and to moderately strong light. These pupillary phenomena result, in all probability, from disturbance of the carotid plexus when the extreme apex of the pyramid is removed and is due to an irritation of the sympathetic fibers.

The point of decussation in the sympathetic fibers as they pass forward to the iris evidently takes place either at or anterior to the petrous apex. This, in conjunction with the pupillary dilatation of the peculiar character above referred to,

may bring out a point in intracranial localization which would be of value.

Several of these cases have complained for years after operation of severe recurring headache. This is in all probability due to the extensive area of dura subjected to cicatricial contraction.

In closing, let me point out that the operation is one of magnitude; many vital structures lie across one's path. The structure of the sclerotic portions of the pyramid is treacherous and the bone often fractures in a manner which is incalculable. Situations arise to make judgment difficult in the absence of experience. Long training in cadaver work is absolutely essential to the operator. The technique of the operation in its final form may vary somewhat from that which I have presented in this paper. Enough, however, is already known to make us feel a sense of pride in the fact that it is the otologist who is called upon to perform what is undoubtedly the most highly technical and difficult operation in all surgery.

ELECTROTHERAPY *vs.* SURGERY

IN CERTAIN ABDOMINAL AFFECTIONS*

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TO those actively engaged in gastroenterology there is apparent a change in the viewpoint of surgeons regarding the advisability of operative procedure in certain abdominal conditions. To one thing more than any other I believe this change is due to the ever increasing numbers of cases in which symptoms persist, or are aggravated, or in which new symptoms appear after operation. The same conditions are even more aggravated after a second operation performed for the purpose of correcting the damage resulting from the first operation. These have become the bugbear of the surgeon and as a result, rather than have the stigma of a large series of uncured or unrelieved operative cases hanging over his head, he is now content to have other procedures tried first. Some of the conditions that particularly fall under this head are gastric and pyloric ulcers, chronic cholecystitis, adhesions about the cecum often diagnosed and operated upon for chronic appendicitis, and also pelvic adhesions. It is because of this attitude of the more conservative and conscientious surgeon that a field has become opened to the electrotherapist that is as fertile for good results as any other in which he has been working. All of the above conditions are better treated with the aid of electrotherapy than by any other method. At this time it might also be said that, when necessary, to electrotherapeutic procedure must be added proper diet and occasional medication for the more immediate relief of symptoms and to assure comfort to the patient.

In order to obtain the best results with electrotherapy and to prevent undue criticism from those who are still opposed to its use it is essential to obtain as accurate a diagnosis as possible. Every available means should be utilized and this is particularly so in abdominal disease where the roentgen ray and other useful tests afford so much information. The rule should be "no diagnosis, no treatment." Begin with the roentgen ray and coordinate these findings with the results of the examination of stomach contents, stools, blood and urine. Above all, obtain a complete history and make a thorough and careful physical examination. If there is any question at all about the diagnosis seek proper consultation. Do not jump to hasty conclusions. Do not make snap diagnoses. When the diagnosis is established as well as it is possible to make it then will be the time to institute the proper treatment by electrotherapy.

What are some of the abdominal conditions that offer themselves for electrotherapy or where electrotherapy should be given a thorough trial before surgical interference is resorted to? This can be answered briefly by saying that any case that does not require immediate surgical intervention is a fit case for electrotherapy. Acute pus conditions, as indicated by symptoms, blood examination or physical examination; indurated ulcers; frequent or severe gallstone or appendicitis attacks, these are the cases that are strictly surgical. Chronic conditions aside from these are suitable for electrotherapy. These are gastric and duodenal ulcers, perigastritis, periduodenitis, chronic cholecystitis with or without adhesions, adhesions about the cecum with or without an associated chronic appendicitis, adhesions involving other parts of the intestinal tract as evidenced by the roentgen-ray examination, pelvic adhesions, chronic oöphoritis or salpingitis

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and postoperative adhesions about the gall-bladder region, stomach, cecum, colon or pelvis.

With the exception of gastric and duodenal ulcers, when one considers the pathology of these conditions just enumerated it will readily be seen how futile are medical measures or rather drug therapy alone. It is true that considerable relief may be derived but an ultimate cure does not seem possible for any lasting period. It is also true that at times one does achieve some excellent results that persist for a long time but these cases are very few in a long series. With gastric and duodenal ulcer however, although as many as 80 per cent of these can be relieved by any rational type of ulcer diet and medication, nevertheless these cures can be aided and hastened by suitable electrotherapeutic means. It can also be stated that damage can be done by improper electrotherapeutic means, as will be shown later. As a matter of truth the object of medical measures alone in all of these cases is to allay symptoms, either locally by soothing agents coming in contact with the irritated parts or generally by lowering nervous tone through the action of sedatives so that with the use of these means it is hoped that nature will have a better opportunity to restore the parts to normal. However, when actual damage has been done either with definite destruction of tissue or by the formation of new hyperplastic tissue, other means must be tried. The only other means are surgery and electrotherapy.

With surgery there is always the possibility, aside from postoperative complications, of aggravating the condition it attempts to correct. This is very well seen in the operative treatment of postoperative adhesions and with cholecystitis with adhesions. Then, too, through the trauma attendant on the handling of the abdominal viscera, surgery can also produce further undesired changes. In this way adhesions at a point away from the site of the operation may be produced. Further still, other conditions present beside that for which the operation is undertaken may become aggravated. This is a frequent occurrence in cases where there is an associated mucous colitis, particularly present with chronic appendicitis or pelvic disease. Inasmuch as there are so many unfavorable points attending operative intervention it becomes almost imperative that electrotherapeutic measures be utilized before any other means are attempted. Fortunately, considerable excellent work has already been done in this field in this country and abroad, and perusal of the literature will be sufficient not only strongly to impress one with the usefulness of electrotherapy but also to give actual experience and the technique with which the results were obtained.

In this paper it is proposed to mention the more common conditions that may properly be called the borderline cases and to point out how and why electrotherapy offers the best means of cure or relief.

Beginning first with ulcer of the stomach or duodenum consider for a moment the pathology present, irrespective of the etiological factor which, to be sure, must be sought out and treated properly, if found. An ulcer represents an erosion of the mucosa, an actual destruction of tissue. This erosion may be small or large. It may be shallow or deep and even involve the muscularis. Its depth may be great enough to set up an inflammation beyond the serosa such as a perigastritis or a periduodenitis. The edges of the ulcer may be in a healthy granulating state or they may be hard, thick and indurated. The ulcer may be the result of focal infection and the crater may be inhabited by the organisms that were responsible for its production in the first place. It may have resulted from an anemia of the part due either to blood-vessel injury or nerve disturbance. The function therefore is to restore the parts to normal by a reversal of the processes that were responsible for its production. This is accomplished first by putting the part at rest either by having the patient in bed, by his giving up laborious work or by the use

of sedatives. To help the condition further there is used protective medication and non-irritating diet. The progress of healing can also be aided by measures that stimulate the tone and resistance not only of the part involved but the body as a whole. For this we have an excellent means in the ultraviolet lamp. Not only has this the power of building up resistance through various agencies, such as the endocrine system, and through changes in the blood stream, but it also has an excellent sedative action on general nervous tone.

It is immaterial whether the source of the ultraviolet rays is the quartz mercury vapor lamp or the carbon lamp but it is important that whatever lamp is used must produce beneficial ultraviolet rays of proper wave length and in sufficient amount and intensity. This can be ascertained only through a definite knowledge of the properties of the individual lamp being used. It has been found that considerable relief from symptoms may be obtained from the use of a phototherapy lamp. The action of this lamp is undoubtedly zonal, affording relief through the nerve endings in the skin over the affected part. When both lamps are used better results are obtained when the phototherapy lamp is used first. Under no circumstances should diathermy be used. It cannot be known whether the ulcer is in proximity with a bloodvessel. It is possible to produce hemorrhage or even perforation by diathermy. I have known instances of such happenings from diathermy when applied by men not properly qualified.

In the treatment of adhesions it is essential to understand the nature of their structure. This is very important since much that is fallacious about adhesions has crept into the literature in the past few years and considerable harm is apt to result from these fallacies. When one reads such literature the impression is obtained that intra-abdominal adhesions are as simple to handle as structures more superficial and more readily accessible. Such expressions as softening adhesions, breaking adhesions, dissolving adhesions are frequently used by writers unacquainted with their nature. Those familiar with the appearance of adhesions as seen at the operating table usually have much respect for them. Adhesions which are fibrotic in nature vary in density, that is in fineness or in thickness just as fibrotic tissue in any other part of the body. The best comparison would be to mention the similarity of adhesions to scar tissue. Scars may be very fine, or they may be thick and tough as seen in keloids. The same problem attending their treatment presents itself in the treatment of intra-abdominal adhesions with the greater difficulty in the latter case of treating something that cannot be seen, that is treating structures blindly and without knowledge of their actual density. In some books and in many articles it is stated that adhesions are best treated by first applying diathermy to soften them and then using the surging sinusoidal current to break them after they have become softened. It is assumed that the regular movements of the intestines are stimulated by the surging sinusoidal current sufficiently to break the adhesions irrespective of their density. It can readily be seen that any surging movement of the intestine sufficient to break adhesions would be sufficient to cause other damage.

The problem as it has presented itself to me is not a question of separation, softening or breaking adhesions so much as it is to repair the damage produced by the adhesions, build up the tone of the parts affected by the adhesions, and in this way lessen the effects of the adhesions. Adhesions cannot be cured any more readily by electrotherapy than they can by surgical or medical means. It is, however, possible to cure the attendant conditions produced by them. Some of these attendant conditions may be secondary gall-bladder inflammation, duodenitis, typhlitis, colitis and even inflammation of the pelvic organs. It is a rather interesting thing to point out at this time that whereas adhesions are,

as a rule, the product of inflammatory processes they also are responsible for the continuation of the inflammatory process after the acute cause has disappeared. It is also plausible to assume that were it not for their presence the inflammation would have subsided much sooner or that it would have entirely disappeared.

Symptoms of adhesions may manifest themselves at some distance from the site of the lesion. It is well known that the symptoms are the result of stimulation by way of the nervous system through reflex arcs. The lesion itself is inflammatory in nature, is the result of trauma produced by the irritating action of the adhesions on the part to which they are attached. There is interference with muscular movements resulting in spastic states. There is interference with nerve stimuli and with circulatory conduct, resulting in blood stasis and poor nourishment of the part. Hence, the things that must be considered for correction are:

1. Reduction of the irritation.
2. Relief of the inflammation.
3. Reduction of spasticity.
4. Stimulation of the circulation for the removal of blood stasis.
5. The building up of tone and resistance of the part.
6. The lowering of nervous hypertension of the patient as a whole.

Electrotherapy has at its command excellent means for producing all of these changes. Of the various means the best are phototherapy and diathermy. The large phototherapy lamp with a 1500 watt bulb is focused over the affected region for its zonal effect and for producing counter-irritation. In this way it acts as an analgesic and makes the part to which it is applied more receptive for the application of diathermy. Diathermy, which acts more deeply on the affected part through its hyperemic action, overcomes stasis by constantly bringing fresh blood supply to the part, thus aiding in the healing of the inflamed area and building up tone. Through its action on the nerve endings in the affected part it overcomes spasticity, relieving the symptoms resulting from this. As a result of the combined action of the phototherapy and diathermy general nervous tension is restored to normal, metabolism is stimulated and a feeling of well-being results. As for the adhesions which were the initial offenders, what becomes of them? They probably remain the same as before the treatment. It is difficult to assume otherwise. Cherry, working with cases of pelvic adhesions, thought that the adhesions in cases treated by this means became less dense and more friable than those in untreated cases. He based these conclusions on a few cases that came to operation for other causes and in which he was able to note the appearance of the adhesions. In my cases, approximating about 400, I have found in a few roentgen-ray films taken before and after the treatment some changes in the outline of the affected parts in the gastrointestinal tract. In most of the cases no changes were evident. Further than this, in some cases that were ultimately operated upon adhesions were found in which it was impossible to say that actual changes such as softening or breaking had occurred. In spite of this the one fact that stands out is that as many as 80 per cent of the patients have remained well and free from symptoms, some as long as four and a half years.

What has been said about adhesions in a general way applies to adhesions irrespective of their location, whether of cholecystic, cecal, intestinal or pelvic. It also applies to postoperative adhesions. The technique used was the application of the phototherapy lamp for twenty to thirty minutes over the affected region two or three times weekly. The more often the treatments the better and quicker the results. This is followed by a twenty minute diathermy treatment. The size of the electrodes and the milliamperage depend entirely on the part treated and the tolerance of the patient to the current. As I have warned before in another publication, I must warn again here against

the use of too small electrodes and too great a current in the obese. The resistance built up by the fatty tissue is sufficient at times to cause actual changes therein. This is manifested by the formation of very tender nodular masses, varying in size and located under the skin. The patients state that these masses feel like boils or abscesses. They persist for as long as two or three weeks.

During the past four and a half years I have given thousands of electrotherapeutic treatments in abdominal conditions, and I have become fully impressed with its value and its future. Before that time our treatment of these conditions was either medical or surgical and there resulted a host of that class of patients often referred to as the "chronic incurables." We were hounded by these as is every other internist or surgeon using medical or surgical means. They are the only black spots on an otherwise successful practice. With this method of treating them I personally welcome them for it is indeed a pleasure to be of service to these patients who would otherwise be operated upon with a further aggravation of their condition.

Physical therapists have an important and valuable part to play in the treatment of abdominal disease. We have a future in this unequalled in any other field in physiotherapy. Not only has our work importance from the standpoint of the results that can be obtained but it has a value in the building up in the minds of the laiety a feeling of confidence in the conscientious physician, a feeling which has been somewhat slipping as a result of both poor postoperative results and propaganda by what might be called the non-medical cults. We must also demonstrate to our surgical confrères that we are not seeking to steal their thunder but rather to work with them, and that by leaving these cases to the electrotherapists it will be to their credit to have a greater percentage of cures in their operative cases. There is no question but that the more conservative surgeons will gladly accept our cooperation, but in order to instill in them confidence in our ability to make good our claims regarding favorable results by electrotherapy we must be in a position to accomplish the results we claim. To do this I must emphasize again very strongly the necessity of correct diagnosis, proper selection of cases and a knowledge not only of the choice and technique of the proper modality for these cases but also a knowledge of the pathology of the condition we are attempting to treat. With the possession of this knowledge we can follow out the treatment intelligently both to its successful end and to our own credit.

TRANSACTIONS OF

THE NEW YORK & NEW ENGLAND
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FRACTURE OF THE FEMUR*

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NEW YORK CITY

FRACTURE of the femur is a surgical emergency and the immediate treatment should be confined to the splinting of the bone in the axis of the limb with sufficient traction to overcome secondary displacements. For this purpose no apparatus is quite as satisfactory as the Thomas splint, which should be available wherever thigh fractures are apt to occur and the method of its application should be sufficiently well known to make its use practically universal. Misdirected attempts at reduction at the site of the accident only produce further local injury and shock to the patient. In my opinion, no femur fracture should receive any except emergency treatment at the site of the accident, and the subsequent treatment should be carried out by a properly qualified surgeon in the proper surroundings and with the proper armamentarium, which, reduced to simple terms, means at a hospital. I cannot see any valid objection to the transportation of an individual with a fractured femur once the proper emergency splint has been applied and except in rare instances a hospital is always accessible.

In any discussion of fracture of the femur the age incidence is of great importance. The important age groups will vary, but it has been my practice to make three age groups:

1. From birth to twelve years.
2. From fifteen years to forty years.
3. From forty-five years up.

In the first group, from birth to twelve years, the commonest type is fracture of the shaft. The results in this group are good if the axis of the limb is reestablished and, if the gross overriding and lateral displacement are corrected, growth will take care of the shortening and correct it in the majority of the cases, as demonstrated in the series by Burdick and Siris. Manipulation and traction usually suffice and open reduction is reserved for those cases in which the interposition of the soft parts or periosteum prevents bony contact between the fragments. Direct fixation after reduction need be used only if the fragments cannot be maintained in position by any other method.

In this age group the cases of epiphyseal separations at the hip and at the knee require complete anatomical reduction, which should be obtained by that method applicable to the given case; and unless thus obtained reduction by open operation is necessary. There is a definite exception to this statement in the epiphyseal separations in infants and very young children, in that many of the epiphyseal separations, although uncorrected, show the formation of a new shaft with normal

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development of the bone after a suitable interval. It is a moot question to decide in which cases this happy outcome will take place.

In the second group, from fifteen years to forty years, a great variety of lesions may be found. The commonest are those of the shaft and the character of the line of fracture is variable, that is, transverse, oblique, spiral and comminuted lines of fracture occur with varying degrees of frequency in any given series.

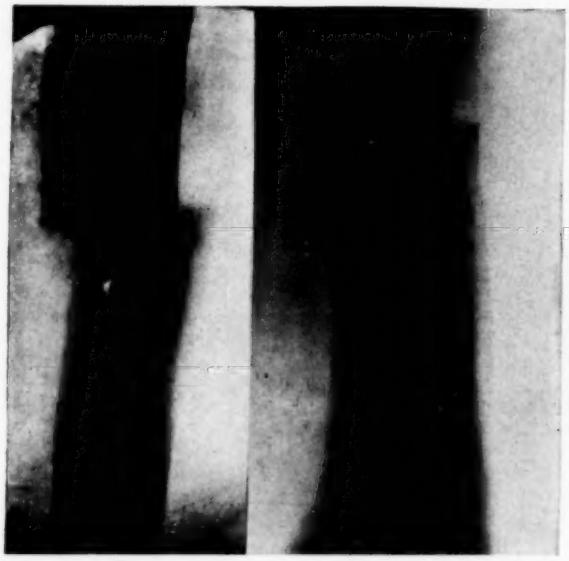

Fig. 1. Transverse fracture of the shaft of the femur. Reduced by manipulation under an anesthetic within two hours after the injury. Incomplete reduction. Complete functional return without shortening. Period of disability, seven months.

In this group manipulation under an anesthetic will succeed in producing a satisfactory reduction only in very rare instances, viz., in the transverse fractures in individuals with weak muscles when the reduction is done within two hours after the injury.

Traction: Adhesive or skin traction is applicable to only a small group of selected cases in which the displacement is very slight, which can be corrected and in which the correction can be maintained by such traction.

Skeletal traction by means of the pin or by tongs is perhaps the most satisfactory method at present in use; it is not a simple method. It requires skill and training and a proper understanding of the result to be accomplished before it can be intelligently used. The impression extant, that if tongs or a pin are applied and traction is obtained by this means on the femur, "the deed is done" has led and will lead to unsatisfactory results. To be used properly skeletal traction should correct the overriding, bring the ends of the bone into apposition and bring the axis of the femur into the correct weight-bearing line for the individual. Complete anatomical replacement is seldom obtained.

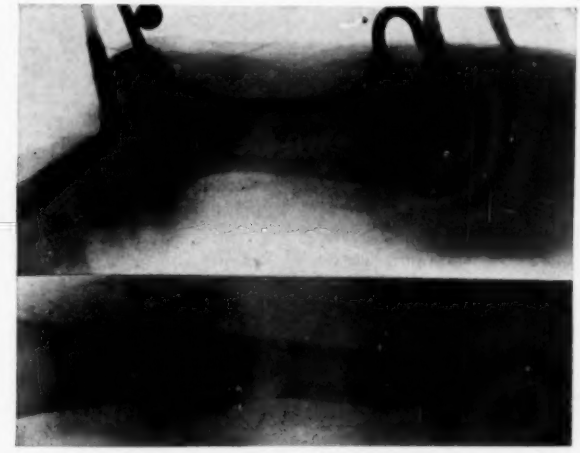

Fig. 2. Oblique fracture, mid-shaft of femur. Skin traction by the Stimson method in Hodgen's splint. Incomplete correction in the lateral plane. Complete functional return without shortening. Period of disability, eleven months.

Emphasis should be laid upon the fact that the femur is not a straight bone. It has a curve peculiar to the given individual and to obtain a satisfactory late result the curve peculiar to that individual must be restored. The application of the tongs or pin is the least important of the steps in the treatment by skeletal traction. The supervision of that traction and the restoration of the weight-bearing axis by abduction of the leg, flexion of the hip or knee or body, counterpressure or countertraction on the fragments are essential, if the end-result is to be a good one.

It is in this group that most of our difficulties arise since it is in this group that the larger portion of individuals with

powerful muscle groups are found. Here also are found the cases in the most active period of industrial life with the greatest need for return to their full earning capacity.

That that return is not at present being accomplished is unfortunately the case. In 96 cases of fracture of the shaft of the femur treated by skeletal traction in the metropolitan district of New York City reviewed by me to establish the amount of disability, only four had completely satisfactory results, while the remainder had to be given industrial ratings from 60 per cent to 100 per cent disability of the leg and in one case with a fracture of both legs a total bodily disability had to be allowed because of the result.

The disability may involve the knee, the thigh muscles and the foot, with limp due to shortening and secondary changes in the joints due to faulty posture. It is no longer satisfactory to consider disability and shortening a necessary outcome of fracture of the shaft of the femur. It is not always possible to obtain all that we strive for, but that does not offset the necessity for doing all that can be done to produce the best possible result; and a perfect functional result with a return to full earning capacity should be our goal.

FIG. 3. Lateral view of oblique fracture of mid-shaft of femur. Treated by tongs traction. Incomplete correction. Complete functional return. Period of disability, six months. The case was a compound fracture, and the skin wound was excised and closed. Primary repair of the superficial wound.

FIG. 4. Left: Transverse dentate fracture of the middle third of the femur. Muscle penetration by the sharp prongs on the lower fragment. Treated by open operation.
Right: Result of the operation with six-screw Sherman plate. Period of disability, six months. Complete functional result. Plate has been in position since February, 1915, without causing symptoms.

Angulation or displacement at the site of fracture has been one of the many difficulties in traction by tongs even under careful supervision. Doctor N. W. Cornell, my Associate on the Fracture Service at the New York Hospital (Cornell Division), has evolved a method which combines skeletal traction with plaster fixation and which so far has met the above difficulties.

A description of his method is to be published.

With regard to the open operation and the use of steel plates in fracture of the femur, wisely used in selected cases, it is of the greatest value especially in that group of cases most difficult to correct because of the powerful muscles, the interposition of soft parts, etc. Operation is seldom

Fig. 5. Fracture of the mid-shaft of the femur. Treated by tongs traction, showing one of the failures of tongs traction spoken of in paper. The lateral view shows very marked angular deformity of the shaft with the apex backward. There is also a lateral angular deformity with the apex inward.

required in individuals under twenty and should rarely be used in those over forty years old. It is not a method to be used by the occasional surgeon who is not properly equipped and it is a nice point to decide which surgeon has that equipment. That there are men so fitted that they use steel plates and the open reduction with great satisfaction cannot be disputed, and Sherman's clinic in Pittsburgh is a good example. To the surgeon who has any doubt about the matter the only admonition which can be given is: don't use the method; use any other method, because safety first is better than regret after.

The time of the operation is also of the greatest importance. There is a marked difference between operations done before the twelfth day and those done after fifteen or twenty days. The early operations disturb the normal bone formation but little, whereas later operations interfere with the normal sequence of bone repair and the plates cause trouble. This disturbance in the normal sequence of events in bone repair is emphasized by Hey Groves as one of the chief factors in non-union, delayed union and, in my opinion, in infections and secondary muscle changes, with limitation of motion in the knee joint, so often reported.

The bone plate has a distinct place in the treatment of fracture of the shaft of the femur and I have used the plate in 98 cases with one death and two infections that necessitated the removal of the plate. All three cases were improperly selected and I would not now operate in similar types. In the remainder there were no non-unions, no stiff knees, no plates removed and, except for the muscle atrophy in the line of the scar, no changes in function or in the anatomy worthy of note. Ninety per cent of the cases were returned to their previous occupation without disability.

After forty, operation should be considered only when the operation will give a result that will compensate for the greater risk connected with the operation; and in the older people that method of treatment should be selected which will fit the needs of the case, that is, the treatment should consider the patient as a whole and not the femur alone.

From forty-five years upward fractures of the femur tend to involve a different area and in the older patients the most common lesion occurs at the neck of the femur. Here also are found a group of subtrochanteric fractures which offer difficult problems for solution.

The abduction method of Whitman with the application of the plaster splint has given results so much better than the other methods that except in rare instances it is the method of election for fractures at the neck of the femur.

Repair of the fractures in cases involving the narrow part of the neck with a satis-

factory extremity may be expected in 50 to 60 per cent of the cases. My own figures are 66 per cent. In fractures through the base of the neck involving the trochanters repair and the functional result are always good.

In the rarer cases of shaft fractures the treatment selected must be adapted to the individual patient and the patient as a whole studied to determine how much can safely be done. After fifty some disability is bound to occur in all cases and it is far more important, for this group, to save the life of the individual than to obtain a perfect anatomical and functional result.

Diabetics, nephritics, cardiac and arteriosclerotic patients present a multitude of problems to be considered in treating fractured femurs. Hence, before resorting to any treatment the whole of the patient must be studied and that treatment pursued which will fit the individual case most satisfactorily.

Gentleness and the avoidance of further injury are, as Darrach has stated, of the utmost importance in elderly individuals.

The reading of this paper was followed by the exhibition of 52 lantern slides, including illustrations of Dr. Cornell's method of combining skeletal traction with plaster of Paris fixation.

Discussion

Dr. Armitage Whitman (New York): It is a very difficult task to discuss a paper in which one finds practically nothing to discuss. Dr. Hitzrot has skimmed the cream off his subject so briefly, so admirably, that there are very few things I find myself prepared to say. I notice a slight note of defiance in his tone as he mentions his application of the Lane plate and his employment of the open reduction of fractures. He evidently expected to be violently disagreed with on this point. I think, myself, in properly selected cases and in the hands of competent operators this operation is one of the most nearly indispensable that we have.

I was also pleased to hear him say that skeletal traction for fracture of the femur is difficult and complicated and requires skilfull maneuver and should also be left only to the hands of those competent to apply it.

From the orthopedic aspect, which I suppose I am expected to dwell on, there is only one thing I have to say, and that is, I heard him mention getting his patients with fracture of the femur, in which he used plates, up in ambulatory splints at the end of three weeks. I think this is very commendable, very bold. I should hardly dare do such a thing myself. Of course we must realize, I think, that the treatment of fracture of the femur does vary according to the surroundings of the patient, the class of the patient, the patient's physical condition and the abilities of the man who is applying the treatment.

This is now very much the age of standardization. The American College of Surgeons is busily engaged, through its various committees, in establishing standard treatment for all types of fractures. I think it is a very commendable effort, but I do not believe it is ever going to work, and I should imagine in associations such as this, that is of railway surgeons dealing with traumatic cases, that various surroundings would find themselves particularly opposed to this standardization.

A treatment that may be successful in a special fracture ward, for example, of a large hospital will be absolutely inapplicable in a small one, where the surgeon cannot give the case his daily personal attention.

We have, therefore, at our command three methods of treatment, that is by traction in suspension, by plaster of Paris and by open operation. All these methods are good in certain hands and in certain cases. They have their advantages and they have their disadvantages.

Traction in suspension is comfortable for the patient. It allows motion in the joints of the fractured limb. In skilful hands it is a most excellent treatment for almost any type of fracture. On the other hand, I know of no treatment in unskilful hands which is so difficult of application and so unsuccessful in its results. Incidentally, it is entirely at the mercy of anyone who comes in contact with the patient, or at the mercy of the patient himself. He may slide around in bed, disarrange his weights, pull his ropes off the pulleys, and, in general, render the treatment entirely futile. It is undoubtedly, as I say, in special wards in large hospitals a most valuable method of treatment.

Second is the plaster of Paris treatment, which, until the Great War, was the method almost universally employed. There again,

plaster of Paris properly applied is comfortable. The patient is absolutely under the supervision of the person who has applied the cast and, in the majority of cases, the fracture having been once reduced and plaster of Paris applied, the thing is finished. You are comfortable in your own mind for about two months, at least.

On the other hand, plaster of Paris not properly applied is the most uncomfortable dressing that could possibly be devised, and very dangerous, as it exposes the patient to the risk of bed sores, and I have seen patients practically killed by its application.

The third method of treatment, that is of open reduction and the application of Lane plates, in skilled hands, has most beautiful results. In unskilled hands its results are tragic.

What I mean by all this is that I hope before I die to see people who are treating fractures of the femur, or fractures anywhere, skilled in these three methods of treatment, and that each case will be judged according to its own merits, according to the surroundings in which one finds it necessary to treat the patient, and according to the particular individual skill of the man who has the case in his charge. Therefore, I hope in the future that the treatment of fracture of the femur will be the treatment not of standardization but the treatment of election.

Dr. Edward Wallace Lee (Randolph, N. Y.): Treatment of the fracture of the femur is a tremendous question. From what I see going on now and from what I have seen in the past, it has not yet to my mind reached anything like a satisfactory status.

During the War fractures were handled in a great many instances in what I thought was a ridiculous manner. Everything was done to get a satisfactory roentgen-ray picture, and I have seen fractures put up and taken down a dozen times in an effort to accomplish this. Of course, a roentgen-ray picture is absolutely necessary; but before we had the roentgen ray we did not get good functional results in fractures, and since its advent there has been so much disturbance in trying to get an alignment corresponding to what the picture demands as a good result that the patient is often worn out, union is delayed and there are unsatisfactory results, just because the extremity was manipulated day in and day out in order to get a perfect picture.

There are several indications that are demanded in a fracture. In the first place, proper adjustment, proper alignment. If you can get that, and then establish traction, and something to hold the bone in alignment, you have accomplished all that is necessary. There has been too much fussing with fractures.

Dr. Baker (Rochester): I would like to ask Dr. Hitzrot in his open reductions what type of preparation he uses, particularly as to the length of preparation, the type of skin preparation, etc.

There is one thought that I have in regard to the cases that are beginning to show circulatory decompensation. I have been having some very happy results in the use of plaster by turning the patient first on one side and then on the other side, tipping the bed up at the foot, and lastly turning the patient directly over on the face, to eliminate as nearly as possible the risk of hypostatic conditions of the chest. Indeed by this method I have been fortunate in not having any signs of the stasis.

Dr. William B. Coley (New York): Dr. Hitzrot brought out one of the most important points of all when he said that in most cases, particularly with middle aged and elderly people, the treatment of the patient comes first and the treatment of the fracture comes second. He also emphasized very truly, I believe, the importance of selecting a method in accordance with the experience of the man who is going to apply that method, which is particularly true with the question of plates. There is a very great difference of opinion as to the value of plates in the treatment of fractures.

Two years ago at the meeting of the American College of Surgeons, Hamilton Russell, the leading surgeon of Melbourne, Australia, told me that he never used the plate in his practice, and believed it very unwise to do so. On the other hand, Sherman of Pittsburgh, as Dr. Hitzrot has said, has very brilliant results with the Lane plate. I think those who are not familiar with the operation, not qualified to carry out the proper technique, had better leave it in the hands of someone who is qualified.

I have one end-result that might be worth calling to your attention. It was in a case where plates were used. A soft tumor of the humerus started about a year later at the site of the plate, and was probably caused by the constant irritation of the plate. There is one method which I think might be used with fruitful results: instead of putting in foreign bodies of bone plates, splints, or screws, we accomplish equally good results by putting

the bones in perfect apposition and holding them in place by heavy kangaroo tendon. I had one occasion in which this method was tried, after several attempts were made at reducing the fracture of the neck of the humerus in which the upper end of the fragment was in the axilla, and three or four weeks later there was a very firm union, and I had a perfect anatomical and functional result.

I am inclined to agree with Dr. Whitman that the perfect and complete standardization of practice is not the ideal, at least, for railway surgery, and we must rely more upon the election method, selecting the methods that are best for the individual case in regard to both the anatomical condition and the age of the patient; and I do not believe that the perfect standardization of practice will ever become entirely practical, even if it may be theoretically ideal.

Dr. O'Neill: I was struck by something that Dr. Whitman said about the possibility of getting motion in an open suspension. I have had a number of cases where the tissues about the wound were very much traumatized, and I felt that I would like to wait before getting a permanent fixation for some restoration of those tissues, and in that waiting I have known that my fixation has been disturbed several times, sometimes by the patient and sometimes by outside influences, and the point I would like to raise is for how long a period may I wait with a feeling that the bones when they are put in that position will reunite?

Dr. B. T. Tilton (New York): I am a strong advocate of traction by the use of the calipers, with reservations. I believe that people who have not tried this method do not realize that it has in it certain very serious dangers of infection, and even of death, and for that reason the insertion of the caliper should be looked upon as a major operation, in my opinion, and should never be done in the ward but always in the operating room under the most careful technique. Furthermore, it should not be done in every case, especially if there is any wound which could possibly be contaminated in the vicinity of the surgeon's calipers and also when there is any fracture in the vicinity of the joint. I think there is grave danger of infection of the joint if one puts calipers in where the joint is already invaded by the line of fracture, but, if we pick our cases, I think that practically 90 per cent of them are suitable for this treatment. I believe we have here the most ideal method for the treatment by traction. As Dr. Hitzrot said, in the cases in which we use the skin traction there are seldom anatomically perfect results. We were satisfied with the half-inch to one-inch shortening in almost every case, but, since we have introduced traction by the calipers we can get in many cases (I will not say in 100 per cent, but in a very large per cent of cases), we can get anatomically perfect results without any shortening whatever and with very good alignment, but, of course, the cases must be very carefully watched to accomplish this. If we find a person intractable, if he does not cooperate, if he takes off his traction, etc., of course, we have to change our method; but otherwise there is no reason why, with a daily looking over of the case, daily revision of the traction, we should not get in practically every case a good result.

I read a paper in Cleveland two years ago (Dr. Coley may remember it) before the New York Central Railroad Surgeons' Association, in which I showed a good many cases of traction by this method. An orthopedic surgeon of Chicago who preceded me had virtually said in his paper that the method of choice in practically all cases should be operative; and his claim was that there was no way of getting anatomical results except by open operation and the insertion of plates. One of the discussers waxed very enthusiastic and said, yes, he agreed with that speaker and he would even go further; he would say that 95 per cent of all fractures of the femur should be treated by open operation. He said that was the only way that an end-to-end result would be obtained. Then I exhibited my pictures, which showed in about a dozen cases an absolute end-to-end approximation and perfect alignment with this by calipers; and a very favorable result was obtained in bringing down this enthusiasm for the open operation, which I think was a very important thing. Dr. Coley at that time in the discussion emphasized the fact that it was very dangerous for a meeting of railway surgeons to say that the open operation was a method of choice, because, if you are going to operate openly, you have got to have the technique of an absolutely perfect operating room.

Dr. Hitzrot: First as to the method and the standardization of methods in the treatment of fractures. It is not so much the method that is used as it is the way in which that method is used. A good method badly carried out cannot produce a good result, whereas a

poor method well carried out may produce a very satisfactory result.

Dr. Whitman and I might find many points of disagreement such as the use of circular plaster splints, but the orthopedic surgeons are marvels with plaster and until the general surgeon becomes as proficient in its use it is wise for us not to condemn it too hastily. I notice that Dr. Blake states in one of his publications that when he expects to use plaster after an operation he has an orthopedic surgeon apply it for him.

In reference to standardization: if we can standardize the human ideas upon such things as politics, religion and prohibition perhaps we may standardize the treatment of fractures. We can agree on what the results should be, but the method for obtaining that result will have many variations.

The question of the choice of any method of treatment must depend upon the equipment of the man. My old chief, Dr. Stimson, had some very definite ideas about fractures and when I had something new or something radical in the handling of fractures it had to run the gauntlet of his criticism. When I could convince him, I was sure that the method had something to commend it. One can standardize the handling of fractures by placing the care of such cases in the hands of men equipped to take care of them. By that I mean by the so-called "fracture service" in a hospital. By this method the result can be improved as it will draw together a group of men interested in fracture problems as it has done at the New York Hospital.

One of the gentlemen said that correcting the axis of the limb was all that was essential. In the weight-bearing bones shortening may and often does produce poor late results. In 1912 I published some results in cases of fracture. Since then I have been able to follow about 25 cases of fracture of the femur, reported in that paper, in which there was shortening of more than one-half inch and which at the early period showed a very satisfactory functional result. Many of these cases now have some disturbance in the knee or hip which has gradually developed with use. The disability has been relatively greater in those cases in which there has been a divergence from the normal axis of the limb together with the shortening.

What was said about too much fussing with fractures is quite true. In one case that I saw recently, a fracture of both bones of the forearm, eleven attempts at reduction were tried in three days and the arm was in terrible shape due to the increased injury produced by such manipulations.

In fracture of the femur our procedure is as follows: An immediate examination of the leg to determine, first, that there is a fracture; second, its location; third, the amount of reaction in the soft parts. If the swelling is marked, a Thomas splint with traction is applied and a roentgenogram made. If the swelling is not marked and if the roentgen-ray picture can be made immediately, we splint the extremity in a Thomas splint and wait for the roentgen-ray film which helps to visualize the fracture. If a roentgen-ray apparatus is not available, we make a detailed examination under an anesthetic, and institute treatment with an attempt to correct the axis and length of the bone by manipulation or by caliper traction, etc. With the roentgen ray we can eliminate cases in which the line of fracture would make impossible any reduction by manipulation. One manipulation is all that should be necessary for, if the first one fails, the second one is not very likely to succeed. The further procedures are discussed in the paper.

Concerning the preparation of the patient before operation: If possible the limb is shaved, washed with a cream composed of equal parts of lime and soda to be removed by sterile water, and the area is wiped with alcohol and ether on the day before the operation. On the day of the operation the ether and alcohol preparation is repeated and the operative area is wiped with 5 per cent thymol in alcohol in the operating room. Tinker and Sutton in their examination of the skin disinfected in this way find it sterile. Just what virtue the thymol has in the immediate process is a question, but it keeps the dressings sweet and prevents the decomposition of the blood with the foul smell so often met in these operations a few days after the operation.

With regard to the use of plaster of Paris and the movement of the patient: In cases with decompensation of the heart, plaster may be a valuable dressing to allow changes in posture. Acute dilatation of the stomach is one of the annoying complications in these cases and unless this is recognized early and treated energetically by the stomach tube, the patients do very badly and I have lost two or three cases which might have been saved had the condition

been recognized early. The difficulty lies in the recognition of a dilated stomach through the large plaster splint.

Dr. Coley raised a point as to the constant irritation of the plate. I can only say that in the cases I have shown here by lantern slides all of the plates have been in twelve years or more. Whether they are causing irritation or not I do not know, but they show no signs of irritation in the roentgen-ray plates and the patients have no symptoms. I believe you can put steel in a bone just exactly as you can put steel in a tree. I mean I think it is an analogous thing. I am doing some experiments on trees with these foreign bodies, and I am trying to study what happens to them.

With regard to the removal of the plates: I have been fortunate enough to have seen some cases in which I have taken out plates after twelve or fourteen years. They are not cases of my own and I would like very much to have one of my own to take out, but these happened to be cases of the other man. The plate was all right, not causing any trouble, or sign of irritation roentgenographically, but some pain in the region of the fracture. No irritation was found in the bone that the microscopist could determine, but there were some deposits of sulphide of iron in the tissues around the bone, and that was all. That is all I can say with regard to plates. I do not know what to say regarding the use of the kangaroo tendon. It may be of interest when I say that I have taken knots of kangaroo tendon out of bone that have been in there a year and six months. All this is a question of the absorbability or non-absorbability of these various things. I think we have wasted our time discussing that question too much. During the period in which the introduced substance is of any use whether it be absorbable or non-absorbable, it is a foreign body; and as to whether it is absorbable afterward, if nature is going to take care of it, she will take care of a non-absorbable as well as an absorbable body, if there is no infection; and personally, I do not feel that in the majority of cases kangaroo tendon answers the question.

Now, that is like everything else; it is again a question of choice of method. I have just recently operated on a fracture of the tibia in which I used kangaroo tendon to fasten it, because it seemed the best method for that particular case.

A MEMBER: How about a metal band, the Parham band?

DR. HITZROT: We have quite a little to learn about the Parham band. I think it disturbs the circulation. I think it has a place, a very distinct place in the treatment, and I have used it about twenty times now, especially in fractures in the humerus and fractures of the radius. In a fracture of the tibia it gave a very bad result.

Regarding the question of the patient's cooperation in traction, there are many points: Motion at the line of fracture during traction is supposed to be prevented by the weight producing the traction. There is an essential feature in traction which has been emphasized by every man that has used it, and that is, one must put on enough weight to pull down the lower fragment quickly. Do not put on weight gradually; one of the things we hear is to put on a little weight, then a little more weight and a little more weight. That is absolutely wrong. If you are going to use 60 pounds put 60 pounds on right off, do not put on 25 pounds today, 10 pounds tomorrow and so on. As soon as you get the bone down you will need only a small amount to hold it in position, so if you use sufficient weight during the time when the patient is very restless, the weight itself will keep him from disturbing the fracture line by muscle pull, unless he is an unusually powerful man.

With traction, you will be successful if your patient will cooperate, but you will not be successful if he is going to slide down and get the traction apparatus pulling against the foot of the bed, because you can not lengthen the bed sufficiently to keep the traction working, and if he is going to disengage the pulleys, or do as one patient of ours did, cut all the ropes that were suspending the apparatus. What is the use of trying to use traction unless you have cooperation on the part of the patient?

With regard to the question of infection with the tongs, I think that is not as important a question as it would seem to be. Infection about these wounds, if you do not get pressure of the tongs or the pin on the skin is not apt to occur. In my experience one of the reasons that infection occurs is failure to pull the skin up and then make the incision, so when the traction comes on the tongs pressure does not occur at the lower angle of the skin wound. In all the cases I have seen where it was said there had been an infection at the wound, this was due to the fact that there had been pressure

on the skin by the tongs at the lower angle of the wound. That point was made by Pearson, who was the advocate of tong traction during the war.

A Member: Have you ever seen any osteoporosis?

Dr. Hitzrot: Only in one case in which there was infection at the same time. Dr. Cornell is at present working on that particular question.

A Member: Does that increase the amount of new bone that is thrown out around the fracture during healing?

Dr. Hitzrot: I do not think so. I did not have time or I would have shown you plates at twelve-year intervals, and all you would notice is the normal repair process you would find in any bone; an amount of thickening just like a plumber's "wipe joint"; the medullary canal is reestablished, and there is not any more than a normal thickening in the cortex of the bone; the callus has undergone the secondary change.

A Member: Is there any difference in the quality of the new bone that is thrown out, whether with open operation or not?

Dr. Hitzrot: I do not know, but I do not think so.

Dr. Lee: In what class of cases was acute dilatation of the stomach after these fractures most likely to take place? Did they have stomach disturbance before, or is vasomotor disturbance created by this dilatation of the stomach?

Dr. Hitzrot: I can only say that it occurs in all types of cases apparently, with no particular preceding gastric disturbance. The decompensation and other cases have some gastric disturbance due to their broken compensation. But in one case just recently, with tong traction, in a man who had nothing at all wrong with his stomach dilatation occurred.

Dr. Baker: In all these cases I put the plaster on over the abdomen, and a window is cut as soon as the plaster is dry, so that the abdomen or the stomach region is entirely uncovered and acute dilatation of the stomach is very quickly discovered in the beginning.

THE MANAGEMENT OF HAND INFECTIONS*

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TO secure the best treatment for infection of the hand, we must begin before an accident occurs. We must eliminate or recognize the diabetic, the nephritic and other chronically ill employees by the periodic health examination. We must impress upon those who handle men that the extent of the injury bears no relation to its seriousness; that the disability from a slight injury neglected, is often greater than that of an extensive one, properly cared for. Finally, we, ourselves, must clearly differentiate the various pathological processes as they are presented. This paper does not deal with epidermophytosis and its allied subacute conditions.

There is a group of infections about the finger-ends that is interesting. The pulp of the finger may be considered as a closed space. Here the epithelium is exceedingly thick. There are no hair follicles or sebaceous glands. A peculiar and important thing is the arrangement of the connective tissue strands which separate the fat bundles. They run at right angles to the bone, in contradistinction to the dorsum, where they are parallel. These connective tissue strands are very strong and thick, and at the end of this anterior closed space they run from the skin to the end of the phalanx.

Infection in this pulp space gives intense throbbing pain, limited to the distal phalanx. Lateral incision is best, because it will open these fibers running at right angles and allow free drainage. If this is not done there may develop an osteomyelitis of the distal phalanx which is due to the shutting off of the blood supply of the diaphysis of the terminal phalanx by the pressure in this closed space and invasion by the offending organism. The flexor tendon protects the blood supply of the epiphysis. The roentgen ray or the probe may make the diagnosis. Sometimes the bone is discharged as a sequestrum and then rapid healing takes place.

The finger nail rests on a nail bed, which is highly vascular and sensitive. The lateral aspects of the nail are overlaid by the nail fold; the proximal edge or root of the nail extends farther under the nail fold than do the lateral edges. In all but the slightest cases of paronychia the pus is situated between the proximal part of the nail bed and the root of the nail, which is usually lifted off the bed, though the exposed portion of the nail commonly remains attached. From here we find the pus working laterally to gain the superficial aspect of the nail and oozing out around the fold. This condition often begins with a slight injury around the nail.

The treatment consists in the use of an anesthetic and an incision to free the *root* of the nail, which should be *removed* if there is pus beneath it, as it acts only as a foreign body and delays healing. A piece of mesh or rubber tissue is applied to keep the incision open, and the finger is kept in a hot dressing of Dakin's or boric acid solution for twenty-four hours either by using a rubber tube in the dressing or soaking the part in a bath. Never incise the matrix of the nail longitudinally because it leaves a split nail.

A splinter or bit of steel may carry infection into the end of the finger just beneath the nail. Drainage should be instituted,

* Read at the thirty-sixth annual meeting of the New York and New England Association of Railway Surgeons, New York, October 23, 1926.

removing part of the nail if necessary. Hot, moist dressings usually suffice.

As we go back along the finger we sometimes find infection on the dorsum, due to infected hair follicles, and carbuncle of the finger is not unusual. In its presence, one should always examine the urine for sugar. The hot, moist dressings are applied after crucial incision to the limit of the indurated area under an anesthetic. At the metacarpophalangeal joint is the proximal closed space which communicates with the palm of the hand, and here web abscesses (so-called collar button abscess) and subcutaneous abscesses may communicate to the palm. It is not an uncommon thing for men who work with shovels to have abscesses develop beneath the calluses at the base of the fingers. The symptoms may seem out of proportion to the appearance of the blister, and yet there may be an abscess under the deep fascia, which here is the transverse metacarpal ligament. Pus here may spread and involve the tendon sheath, lumbrical muscle, digital vessels or the bone. Successful treatment results when we remember all the possibilities and are not satisfied with just taking the top off the blister.

Mock of Chicago in reviewing 1600 cases was struck by the rarity of cases of streptococcic infection of the hands of those employees who had streptococcic sore throats; usually the infection is by staphylococci.

The lymphatic distribution often causes us to err in placing our incisions, because usually we incise where the greatest swelling is located. In the hand this does not secure the best results. The lymphatics from the fingers run for the most part to the dorsum of the hand, following the veins so that we see swelling of the back of the hand due to this and also to the fact that while the palmar fascia prevents swelling on the palm, the loose arrangement of the subcutaneous tissue on the dorsum favors it. Lymphatics from the palm run to the dorsum, and we sometimes incise here when the pus is ventral. The lymphatics follow the veins up the arm, and in acute infection the red streaks are familiar to us all. The glands just involved may be the epitrochlear, if the infection is on the outer aspect of the hand, or the axillary if on the inner aspect. The infections result from insignificant wounds with virulent organisms or poor resistance. If a focus is found, open it. Then apply hot, Dakin or boric acid solution dressings, mercurochrome and splints, and give morphine for pain; also hypodermatoclysis and transfusion if needed. Splinting in a position of anatomic rest is important because the motion of muscles spreads the infection.

In the diagnosis it must be considered that acute tenosynovitis differs from lymphangitis or acute cellulitis. The flexor tendons possess definite tendon sheaths, which run down into the palm in some cases, and in others stop at the base of the finger. We find the one of the thumb communicating with that of the little finger through expansions of the sheath called, respectively, the radial and ulnar bursae. The fact that often these patients have tried poultices for several days (late cases, referred cases) makes the diagnosis more difficult and lessens the chance of perfect function. The semiflexed position, the one of greater ease, the unwillingness to extend the hand, the tenderness sharply localized to the limits of the sheath, the swelling of the dorsum, are all important in the diagnosis.

The technique of operation is most important. General anesthesia, bloodless field, small retractors, good light, sharp scalpel, and patience are all required. Incise to the side of the midline, not cutting the flexion creases. Do not leave a drain over twenty-four hours, for adequate incision will secure adequate drainage. Mesh is the best drain; splinting, with a splint in a position of anatomic rest, is most important; bathe the hand in hot 0.5 per cent sodium citrate, boric acid or Dakin's solution every six hours for forty-eight hours, then 95 per cent alcohol to reduce

the bogginess; and finally dry dressings. Hot dry air is soothing and the electric light rays aid healing. It is important to prevent secondary infection, and when not immersed in the bath, the hand should be wrapped in a sterile towel. Early motion shortens convalescence and gives better results.

It is a good idea in all cases to soak the hand for an hour in Dakin's solution and then wrap it in a sterile towel before the patient is brought to the operating room. Mercurochrome 2 gms. in 35 c.c. distilled water, 55 c.c. 95 per cent alcohol and 10 c.c. acetone make a good skin disinfectant. The use of sterile stockinette instead of towels has proved very convenient to exclude the rest of the hand from the operative field, or putting on a rubber glove answers the same purpose. Tetanus antitoxin should always be given whenever the skin is broken and there is much contusion.

Infections of the radial and ulnar bursae usually are extensions from the thumb and little finger tendon sheath, respectively. We find an enlargement of the previous area of tenderness and greater swelling. We must bear in mind that this may come through the common flexor sheath, the radial bursa sometimes being secondary to the little finger sheath, and vice versa. The incision may be made along the tendon. Secondary hemorrhage from the radial artery may follow and this possibility must be borne in mind. If the infection extends to the forearm, Parona's space must be drained. Kanavel says: "Starting one and a half inches above the tip of the ulna, incise to its flexor surface. With a clamp, open the area just ventral to the flexor surface of the two bones and cut down on the point of the clamp on the radial side. Enlarge the skin openings for through-and-through drainage."

There remain for consideration two spaces, the thenar and middle palmar. These spaces are deep and lie between the flexor tendons and the metacarpal bones. They are difficult to visualize but a careful study of Kanavel's book aids wonderfully. They are separated by the insertion of the adductor transversus muscle. The midpalmar space is an inverted truncated cone with the base toward the fingers. Infection in these spaces comes from the tendon sheaths or from puncture wounds. The signs are usually definite in the midpalmar space. There are loss of concavity of the palm and great swelling of the dorsum of the hand. The thenar space shows great swelling, limited by the anatomical shape. Treatment consists in incision, opening of these spaces with clamps, drainage and the usual postoperative care. Do not suture the incision. If it is long put in stitches but do not tie them until the third or fourth day. The incision for the thenar space should be made between the thumb and the index finger, and a clamp pushed down to the middle metacarpal bone. Opening of the midpalmar space may be effected between the fourth and fifth fingers and a clamp forced down underneath the tendons to the middle metacarpal bone.

Conclusions

1. Infections of the hand challenge our most careful attention because of their number, and their importance in decreasing the earning power of the employee.
2. The smallest wounds may be the most disastrous.
3. Anatomical information, bloodless field, sharp scalpel, good light, patience and a general anesthesia are essentials.
4. Never forget tetanus antitoxin.

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Discussion

Dr. Brooks W. McCuen: Dr. Le Seur has presented his splendid paper in a very clear, concise and logical manner. He took up first the anatomy, then the symptoms and diagnosis, and then the treatment.

Without a thorough knowledge of the anatomy of the hand you cannot interpret the symptoms and make an accurate diagnosis, and, if you cannot make an accurate diagnosis, the treatment is going to be of no avail.

Further, if you place these incisions outside of the bursa that is infected, then you do not get adequate drainage. If you do not get adequate drainage (and Dr. Le Seur called attention to that as being the keynote of the treatment) you will have disastrous results.

Many of us have seen such cases as this: A thickened hand, an infected hand, with an incision on the dorsum. The drainage is not adequate there; the infection is going on all the time. Because the infection is in the palmar sheath an incision on the back of the hand does not give adequate drainage and the infection will rapidly go up the tendon sheaths.

My idea is that in these infections, with the fingers involved first and then the hand, there is a throbbing, swollen abscess or an infected area. If you make an incision there you will relieve that pressure. Pus is discharged through the surface, and it gives nature a chance to do what it intended to do, that is, it will try to burst through, and the infection will subside. The infection decreases, and the glandular infections will then subside if you get them early, and that brings us to one other thing.

I think the responsibility in these hand infections, which are so numerous, as mentioned by Dr. Le Seur and yesterday by Dr. Moorhead, is that these workmen often have cuts and many of them come with an infection and when I say: "That needs to be opened," they will say: "I have had hundreds of these cuts and have never had an infection before." Frequently to these patients when they say they have had cuts and punctured wounds many times before and never had an infection, I reply: "There are a great many people in the cemetery who were never there before." Then they stop to think: "Well, maybe this is an infection."

Dr. Le Seur emphasized a general anesthesia. This is certainly very important in all except the very minor types of infections. If you try to open an infected hand, which is very painful as you all know, with a local anesthetic, the minute the point of the knife touches, it increases the pressure, and gives more pain in spite of the fact that you may have tried to use ethyl chloride, or something else of that sort. The patient will pull away; you have made a very poor incision and you do not get (again the keynote) adequate drainage, and then you are going to get a disastrous result, because the patient will not submit to the second or third incision in the hand.

Again repeatedly I have had patients come to me with what I like to term "medical incisions." Someone has previously just put in a little cut, a stab wound and left it without wicking, or anything to allow the drainage to take place, and that infection is traveling right up the arm, involving other spaces.

I do not agree with Dr. Le Seur about drainage. Dr. Kanavel mentions the use of vaseline gauze, but I like to use iodoform gauze, as I think it is preferable to the plain gauze. I put some vaseline on; I put that drain well in; and I leave it longer than twenty-four or forty-eight hours. I like to let nature even force it out, because I like to have a wound open down to the seat of infection.

Dr. Le Seur advised rest of the infected part for a few days on a splint. I think that it is a very good thing to immobilize the part during the first few days of the acute infection. Immediately that there is adequate drainage down goes the swelling, the pain is relieved and the patient is better; then you can take the splint off and begin active and passive motion, because a good result is what you are after.

Recently the Vice-President of the New York Central Railroad sent out a bulletin intended for surgeons, foremen and others, to impress the importance of getting these patients back to work early, and immediately a man is injured, of sending him to the physician. That is what we want. We want to get our cases back to work early without any permanent disabilities.

If there is an infection of the hand, we all have to take note of it, because we have to face our own results before the Compensation Board or the Claim Department. If the employee has a crippled hand or the loss of function of one finger as a result of infection, you have to face that and you have to tell why it has happened.

If we begin motion early nearly all of these patients will say: "Wait, wait"; and if you leave it to them they will wait until the pain has left the hand and then it is too late. Adhesions have taken place in the tendons and the hand is stiff. My own idea is to begin early. I employ passive motion every day I see them, and I instruct the patient himself to move his fingers every hour of the day in order to prevent the adhesions.

Here is a case that is finished. Dr. Le Seur did not mention that, and I shall just say a word about it. On Friday or Saturday you say to a patient: "Go back to work on Monday." This patient is supposedly discharged and I mark him off to return to work on Monday. In two or three weeks the Motive Department or the Claim Agent will call up and ask, "Where's So-and-So?" I say: "He went back to work two or three weeks ago." They say: "No, he hasn't come back to work." I had lost sight of him and he is waiting until the pain has gone and the use of the finger comes back. I do not think that we as surgeons ought to discharge those patients until they are back to work with good functional results. If possible I like to refer them then to physical therapy, and I do not wait until the wound has healed but send them early for this active and passive movement and massage. I think that those that are to be referred to physical therapy should be selected cases. Do not allow them to go to the physical therapist and forget all about them. If you do, it will be sometimes two or three months before you hear from them again, and they will still be out of work. You owe it to the patient and to the company and to yourself to see those patients in that interval every week or every two weeks, at any rate, until you get them back to work.

Dr. Le Seur: I want to thank Dr. McCuen for his excellent discussion, which supplements the paper admirably. The one thing, perhaps, for us to remember (and he brought out the seriousness of these infections) is that these cases ought not be treated in the office. If there is any sign of the condition becoming more than a very superficial one, they should be sent to the hospital. We will save ourselves worry, the man pain and suffering and the company money, by doing that.

Another thing is the adequate incision. I believe if you make an incision long enough and deep enough you will not have to pack it to keep it open.

TREATMENT OF NON-PENETRATING WOUNDS OF THE ABDOMEN*

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THE treatment of non-penetrating wounds of the abdomen is so closely linked to the question of diagnosis that a proper consideration of the one must of necessity include, to a certain extent, a discussion of the other. In penetrating wounds of the abdomen, the indications for treatment are commonly quite obvious but in non-penetrating wounds the problem of diagnosis and treatment is usually perplexing. Moynihan in his recent work on Abdominal Operations makes this statement: "Any surgeon whose experience of hospital work is extensive will have realized the great difficulty that almost always exists in discriminating in the early stages between those cases of abdominal injury which are trivial, and those in which a laceration of the intestine has occurred." This statement is equally true when the question of injury to other abdominal viscera is under consideration. The greatest difficulty of diagnosis exists in the early stage which is obviously the optimum period for treatment.

In order to arrive at a proper diagnosis upon which treatment must be based, it is necessary to review carefully the history of the injury and note the subjective and objective symptoms. Primarily there are two kinds of blows to the abdomen; generally the type of injury depends upon the kind of blow. The first of these is a local injury as where the individual comes suddenly and forcibly in contact with some small sharp object such as the corner of a table. This type of injury commonly results in damage to the structures immediately in the region of the point of injury. The other type of injury is the diffuse, such as is seen where the abdomen is run over. In this type, damage to the intra-abdominal organs usually occurs at the fixed points of the intestines or the vascular pedicles of the solid organs. Repeated and careful consideration of the symptoms is often essential to an accurate working diagnosis. The onset of new symptoms, the rise in the pulse rate, the change in the temperature, the increase or decrease of spasm of the abdominal muscles must all be carefully noted with frequent and painstaking study. Early diagnosis is of the greatest value in these cases for time is an exceedingly important element.

With these remarks on the difficulty of diagnosis in non-penetrating wounds of the abdomen I shall proceed to a general discussion of diagnosis and treatment which will be followed in turn by a discussion of the problem as applied to the individual organs. I shall not concern myself with the treatment of the complicating wounds of the abdominal wall, even though they be non-penetrating, for the reason that the method of treatment of such injuries is usually obvious. I shall include in this discussion injuries to the kidneys, which are in reality intra-abdominal organs. The extent of the damage to the contents of the abdomen may vary from simple contusion to severe laceration or rupture of an organ. Large vessels may be torn, segments of the intestinal canal may be completely separated or the tissues so damaged that secondary perforation or

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gangrene ensues. Commonly, injury is confined to one organ or to one segment of gut but multiple injuries are not at all rare.

Patients with serious abdominal injury commonly present symptoms of severe shock. The pulse is rapid and of small volume, the temperature is subnormal, there is a pinched expression on the face. Vomiting usually occurs soon after injury; it is persistent, and in cases of intestinal rupture is present almost without exception. With reaction from shock, an elevation of the temperature is to be anticipated. Localized acute tenderness over the injured structure is usual before the spread of peritoneal irritation. Spasm and rigidity of the abdominal muscles appear quite promptly and do not yield to morphine. In the later stages abdominal distention takes place. Free fluid, which may be blood, feces or peritoneal exudate may be discovered in the flanks. It is frequently necessary to make repeated examinations in these cases in order to arrive at a satisfactory diagnosis. In some instances it is impossible to make such a diagnosis and after a reasonable attempt has been made, operation should be performed without further delay.

Treatment in these cases is first directed to combating the condition of shock. Heat, morphia and rest are important temporary measures. If not incompatible with the condition of shock, a modified Fowler position is desirable for obvious reasons. Fluids, as they can not be given by mouth, must be administered by rectum, subcutaneously or intravenously. Ordinarily warm saline solution is probably the most satisfactory fluid to use. In the cases that exhibit more profound shock, the use of glucose and insulin is indicated. Glucose is supplied in handy, sterilized ampoules each of which contains 10 grams in 20 c.c. of solution. This may be given intravenously without dilution or, if greater fluid volume is desired, it may be given in saline solution. It is wise to limit the total volume of intravenous solution to 500 c.c. and this quantity must be given slowly, otherwise cardiac dilatation may be induced. Insulin, 1 unit to 3 grams of glucose, is given in the usual manner to burn up the glucose. Half of the required dosage of insulin should be administered just after starting the intravenous injection and the remainder at the end of the process. In the more serious cases, transfusion of whole or citrated blood is an exceedingly valuable procedure.

As previously noted, diagnosis is difficult. The safest rule to follow is to operate if in doubt, except in cases of suspected kidney injury. The persistence of vomiting and a rising pulse rate are sufficient to demand exploration. It is better to perform an occasional unnecessary exploration with little risk to the patient than to delay operation in that case where it is urgently needed. The majority of these cases stand surgery quite well after they have reacted from the state of shock. If after observation for two hours, the general condition of the patient has not improved and symptoms of internal hemorrhage are present, laparotomy should be performed in spite of the presence of shock. The type of operation will depend upon the extent of the damage and the condition of the patient. Speed is essential but is secondary to safety. Mere packing of a lacerated liver or kidney may be all that we dare do; if the damage is to the intestinal tract, perhaps resection and enterostomy rather than anastomosis may be advisable. In other words we must proportion the shock of the proposed surgical procedure to the estimated strength of the individual patient, for a live patient who will require secondary operation is better than a dead one who has had too much. The usefulness of the omentum as a tampon to secure hemostasis or to reinforce suture lines is not to be forgotten. When the injury to a solid organ has resulted in considerable hemorrhage, it is wise to leave the blood within the abdomen so that it can be absorbed. When operation is delayed for twenty-four to forty-eight hours and there is evidence of abdominal hemorrhage, one must pro-

ceed with considerable caution as the sudden relief of intra-abdominal pressure, resulting from incision, is very likely to start up brisk and ofttimes fatal hemorrhage. Following operation in these cases, treatment will depend largely upon the extent of the injury and the reaction of the patient. The same measures advocated for use before operation are of value after operation especially in the replacement of fluid loss.

Injuries to the stomach are rather uncommon due to its protection by the costal arch and because of its relatively thick walls. The only type of injury which justifies consideration is rupture of the stomach. The symptoms are those of serious injury to any abdominal viscus. Pain is very severe and localized. Vomiting is frequent and occasionally the vomitus contains blood. Collapse comes on very promptly after rupture of the stomach, especially if the tear is of sufficient size and the stomach contained much food. Immediate operation is indicated where rupture of the stomach is suspected. Suture of the laceration should be by double layer of inverting stitches. If the laceration is near the pylorus care must be taken in placing the sutures to avoid narrowing of the lumen which will occur with the healing. Reinforcement of the suture line with a tag of omentum is a useful method of preventing leakage. If there has been only slight contamination of the peritoneum closure without drainage is safe. Otherwise drainage is indicated. In those cases where extensive contamination has taken place, drainage of the pelvis through stab wounds is necessary in addition to local drainage. Postoperative treatment is similar to that used in any case of gastric surgery in which the danger of peritonitis is anticipated.

Injuries to the intestines are of varied types. The gut may be crushed; it may be ruptured; it may be torn at a fixed point; it may be so damaged that secondary perforation results; gangrene may ensue because of injury to the mesentery. The ileum is more commonly injured than any other portion of the intestinal tract. The symptoms of serious intestinal injury at first are those of shock. Persistent vomiting is a most important sign as it is present almost without exception in cases of intestinal rupture. Rigidity and muscle spasm are marked. In a few hours abdominal distention appears and free fluid may be discovered. It is well to remember that in injuries to the jejunum, symptoms are frequently delayed for hours. In the treatment of these cases of serious injury to the intestine, speed is one of the essentials. Operation within six hours following injury gives the best results. It is wise to wait until primary shock is over before operating. One of the chief dangers in operations of this nature is from prolonged evisceration, which is to be avoided. Warm towels must be freely used to protect the exposed intestine from undue chilling. In locating the lesion we search for lymph exudate, blood or feces as our guide. It may be necessary to examine methodically the entire length of intestine. Simple suture of the tear in the gut may suffice if it is small and single. A double inverting suture, reinforced by omentum, makes a satisfactory closure. In other cases where the laceration is too extensive or gangrene is imminent because of interference with the circulation, resection and anastomosis may be necessary. In these cases where the condition of the patient will not warrant anastomosis, the damaged loop of gut may be brought out of the abdomen as is done in performing operations for malignant growths. In those cases in which anastomosis is done, it is wise to perform an enterostomy above the site of anastomosis, which will serve as a safety valve. Before closing the abdominal incision, the peritoneum is sponged carefully to remove all foreign material. Drainage is usually desirable in all of these cases. The cigarette drain is the safest type from the standpoint of injury to the intestinal wall and will suffice in most cases. The drain should be removed as soon as safety will allow for

we all appreciate the damage resulting from prolonged irritation of a drain. Usually forty-eight to seventy-two hours are a sufficiently long period to leave the drain. Postoperative treatment is similar to that for other cases of intestinal surgery.

Serious *injuries to the liver* are generally in the nature of lacerations or so-called fractures. The common site of the fissure in cases of rupture of the liver is along the falciform or coronary ligaments. Hemorrhage varies with the severity of the lesion. In serious injuries hemorrhage may be rapidly fatal. The symptoms of serious liver injury are those of shock, localized pain and tenderness with signs of hemorrhage. Free fluid in the abdomen is a very important sign especially when associated with increasing pallor and a rising pulse rate. Treatment consists of controlling the hemorrhage and repair of the laceration. Upon opening the abdomen in these cases smart bleeding may result from the decrease in intra-abdominal pressure. In some instances control of hemorrhage can be accomplished only by tamponing with gauze; in others the omentum may be used as a natural tampon. Bleeding points are clamped and ligated if possible. Suture of the friable liver can be accomplished by carefully using blunt needles and large sized suture material. The use of drainage depends upon the amount of uncontrolled oozing and the presence of free bile. Postoperative treatment is similar to that for any other serious intra-abdominal injury.

Injuries to the spleen are somewhat like injuries to the liver. Tears are generally in the direction of the blood vessels. Even small tears may occasionally give rise to fatal hemorrhage. The symptoms are those of abdominal injury, i.e., shock, pallor, rising pulse rate, etc. The location of the injury and the site of the pain are often very helpful in making the diagnosis. In some injuries all that is needed is suture of the laceration; in others packing may be necessary; in the most serious type splenectomy is indicated. Drainage of the abdomen is not required, as a rule.

Injuries to the pancreas are serious because of the liberation into the abdominal cavity of pancreatic juice. With the occurrence of this, marked peritoneal irritation is evident. There are no special symptoms of pancreatic injury except the rapidity of onset and spread of peritoneal irritation which occurs when there is laceration of the organ. Complete rupture of the pancreas does occur. The duct of Wirsung is occasionally torn. Before any investigation of the extent of the damage to the pancreas is begun, it is absolutely essential to wall off the rest of the abdomen with tampons. Any free blood or pancreatic juice must be wiped up at once. The best approach to the pancreas is probably through the gastrohepatic omentum. In repairing a laceration of the pancreas, deep sutures through the body will usually hold. Suture of the duct should be attempted if it is torn. Resection of the tail of the pancreas may be necessary where the organ is seriously damaged. Drainage is essential in all cases of pancreatic injury.

Injuries to the kidney vary in severity from simple contusion to actual rupture. Shock follows these injuries. The cardinal symptoms of serious kidney injury are hematuria, diminished excretion of urine, pain localized in the kidney region and a tumor mass in the loin. The shock must be treated along lines similar to the methods advocated in other cases presenting shock. Catheterization of the bladder is a dangerous procedure in this condition because of the likelihood of infection, for infection of even a slightly damaged kidney may make nephrectomy necessary. Operative treatment should be conservative as fatal hemorrhage can probably not occur unless the renal artery or vein is torn. Immediate operation should be performed if the patient fails to react from shock. The common indication for operation is an enlarging tumor in the loin. The persistence of anuria for twenty-four hours is another indication. Later, signs of beginning sepsis make operative intervention necessary. The type of operation will

depend largely upon the severity of the injury. In most instances simple suture, with or without packing, is all that is required. Speed in operating is essential but safety must not be sacrificed to it. Rarely is primary nephrectomy indicated in these cases and its performance, increasing the already existing shock, is often fatal. Later, nephrectomy may be necessary because of prolonged bleeding or the appearance of sepsis.

Injuries to the bladder, except rupture, rarely demand surgical intervention. Rupture of the bladder may occur from external violence or spontaneously. Rupture or laceration of the bladder is most commonly the result of a fracture of the pelvis. The rupture may be extraperitoneal or intraperitoneal. The latter is the more common type. The extraperitoneal rupture results in a cellulitis while the intraperitoneal rupture causes peritonitis. Patients with a rupture of the bladder commonly give a history of a sensation of feeling something tear at the time of injury. They have frequent desire to micturate and attempts to do so result in the expression of a small amount of bloody urine or no urine at all. Too much reliance must not be placed upon the test of injecting water into the bladder for, in a few instances, recovery of the total volume is reported. In cases where serious injury to the bladder is suspected, immediate operation should be performed. If the rupture is thought to be intraperitoneal, the peritoneum is opened and explored. The laceration is inverted and sutured in two layers, the peritoneum is cleansed and the abdomen is closed with drainage. If no intraperitoneal rupture is found and there is still suspicion of a rupture of the bladder, the incision is closed and the bladder is opened extraperitoneally through another incision. If a tear is found in the bladder mucosa, it is repaired from within. In either type of rupture of the bladder it is always wise to protect the suture line after operation by the use of a retaining catheter.

It is not generally recognized that a true *traumatic ileus* can follow abdominal injuries.

Recently I cared for a patient who had fallen a considerable distance and sustained a fracture of the skull and hip and a contusion of the abdomen. Within twenty-four hours from the time of injury, abdominal distention was noted. This progressed rapidly and vomiting soon appeared. The vomitus became fecal in character. Enemata of all kinds, pituitrin and eserine were ineffectual. Repeated gastric lavage afforded no relief. Twelve hours after the onset of these symptoms, jejunostomy was done. This was followed by slight improvement but, within thirty-six hours from the time of operation, the patient expired. Post-mortem examination revealed a generalized distention of large and small intestine without any other sign of injury to the abdominal viscera. The injuries to the head and hip were not of sufficient severity to have caused death. From the condition found at the autopsy, it is obvious that this patient died of a generalized intestinal atony and that a single enterostomy could have done little good. Perhaps multiple enterostomies would have drained sufficient of the gut and resulted in recovery.

A condition encountered in another case is worthy of brief mention here. A boy, aged twelve, after a fall of about 30 feet, was admitted to hospital with a concussion of the brain, multiple bruises and abrasions and a fracture of one of the fingers. After admission the pulse rate rose rapidly, the symptoms of shock increased and progressive rigidity of the abdomen was noted. Vomiting was persistent. The boy remained in coma so we were unable to have the advantage of any subjective symptoms. After observation over a period of six hours with no improvement, exploration of the abdomen was performed. Extensive *subperitoneal hemorrhages* were found. The intestinal serosa was dotted with hemorrhagic areas; the retroperitoneal tissues were almost black with extravasated blood. Realizing that surgical treatment offered little, the abdomen was closed and general treatment for hemorrhage and shock was instituted. The boy made a satisfactory recovery. This case illustrates the difficulty of diagnosis in abdominal injuries.

CONCLUSIONS

1. The diagnosis of serious injury in cases of non-penetrating wounds of the abdomen is frequently difficult.

2. A rising pulse rate and persistent vomiting are sufficient signs to justify exploration.

3. Prompt exploration should be performed in all suspicious cases except in kidney injuries.

Discussion

Dr. Le Seur assumed the Chair.

Dr. Bradley Coley: I think this is one of the most interesting and most helpful papers we have had at any meeting I have attended. It is very interesting to me because at Bellevue Hospital we get these traumatic abdominal cases not infrequently, and they tax our ingenuity and our judgment more than any other cases we have, I think. I should like to cite briefly a few cases that bring that out, and expand a little bit on some of the points Dr. Dickinson brought out.

About two months ago I was called to Bellevue to see a man who was admitted shortly before with a history of having fallen about 6 feet and having struck his left lower costal margin against a beam. He came in a wheel chair, and as it was a non-urgent case he was put to bed and examined. It was noted that his general condition grew rapidly worse; that he was pallid, cold, obviously in shock; the pulse rate was climbing and he developed a general abdominal rigidity. The bullae that were seen on his skin over the lower ribs on the left side suggested to us at once the possibility of a ruptured spleen. Through a left rectus incision we found a tear through the substance of, and extending two-thirds of the distance across the spleen, and involving a splenunculus. A splenectomy was done; and I call attention to this feature: The man had approximately a quart of blood in his belly cavity. We had read of the maneuver of autotransfusion and we had been waiting for a suitable case to try it. With a small sterile cup that was used for novocaine we bailed blood out of this man's belly into a basin. We succeeded in recovering in that manner, over 700 c.c. of blood, to which we added all the blood we could squeeze out of the laparatomy pads, and we gave him a transfusion of over 700 c.c. of his own blood. We called a couple of internes to do this while we were operating. By the time the splenic pedicle was tied he was beginning to get his blood and the transfusion was continued while we sewed up his abdomen. The man made an uneventful recovery, though his condition was so precarious I feared for a time that we would lose him on the table. I feel convinced that his recovery, if not entirely dependent upon this transfusion, was largely aided by it. We gave him another transfusion from a donor, within a few hours, but I doubt whether without the autotransfusion he would have stood the strain until we could get a donor for a regular transfusion. I commend this maneuver when you meet a similar case of any severe bleeding of the abdomen.

Dr. Dickinson spoke of ruptures of the liver. I have had 2 such cases to operate upon. A stranger in town jumped off a surface car while it was going, struck an elevated pillar and had a severe laceration of the right lobe of the liver. The operation was simply an exploration and packing of the wound, which is about all one can do with a severe liver injury. That patient died. The other case was of a young girl run over by a truck. Her abdomen was traversed by the truck wheel. She had an even more severe laceration of the liver and was treated the same way. The outcome in her case was fatal also.

These liver wounds are obviously not suitable for suturing, as a general rule, for the sutures are prone to tear out of the liver. I think that tight packing and autotransfusion might save some of these cases. Very often they die before one can get things going for transfusion from a donor.

I had another case that puzzled me. It was very much like the one Dr. Dickinson cited. This man had been struck by two packing cases, in the lower abdomen. He was admitted to the hospital where I saw him at 7 o'clock at night. He had been seen in the afternoon by one of my colleagues who thought operation was not indicated. When I saw him he had obviously a severe contusion of the abdomen but it did not seem to need operation at that time. Seen again at 11 P.M. I found he had passed pure blood from his urethra. I called upon the genito-urinary service to give us some help. They cystoscoped the man, but could see no tear. They suggested filling his bladder with boric acid solution. That is one means they have of determining a bladder rupture. This seemed to me to be contraindicated because the man had

an active urethritis; so I decided to operate at once. I discovered a hematoma as large as a pancake and of the same general shape and size, and about an inch thick. It extended down to the retroperitoneal portion of the bladder and filled the triangular space posterior to the bladder, but I found no evidence of an actual separation or tear of the bladder wall. It seemed to me at the time that to incise on this hematoma and to turn it out would be dangerous, for the reason that it would convert a sealed off hemorrhage, which was obviously being tamponed by nature, into an open intraperitoneal bleeding, and very likely we would not be able to locate the point of bleeding. Therefore I closed the abdomen without drainage, and the man made an uneventful recovery. He developed a postoperative hernia. I repaired this hernia about 3 months later and at that time I had an opportunity to explore his abdomen. The hematoma had been entirely absorbed and the abdomen was practically negative.

I make one plea (I think Dr. Dickinson has brought this out already) any puncture or bullet wound of the abdomen should be explored, no matter how trivial. We have seen cases where it seemed almost certain that the peritoneum had not been opened, and on exploring we found extensive damage to solid or hollow viscera. We have also seen a case where the bullet wound of entrance was in the thorax with no wound of exit, and the patient was suffering chiefly from abdominal symptoms, and the bullet was found on laparotomy to have passed down into and severed the colon. These things we cannot find out without exploring. I have seen stab wounds where the thing looked shallow and superficial and, on exploring, the omentum was found just under the skin, and in one case a liver was punctured. In *all* these cases the tract should be explored most carefully in the operating room or we will get into serious difficulties.

Dr. Baker: About two weeks ago a man was brought into the hospital at about 11.30 one morning, with the history of having endeavored to start a gas speeder with his helper; he stumbled and fell forward on his face. He had absolutely no signs of any trauma on the abdomen or chest. He had a pulse rate of 60, which did not go higher than 80 until about 9 o'clock at night, I saw him at 11:30 that night and at that time his pulse was 96, and his temperature was normal. At half-past ten he had vomited a little watery fluid. Those were the only signs, with the exception of one, a very marked spasm of the abdominal muscles, that were present from his entrance into the hospital.

At half-past one in the morning the hospital called me and said that the man was in shock and probably would not live until I reached him. On my arrival his pulse was almost imperceptible, and it was determined then to use intravenous saline infusion and endeavor to explore the abdomen. We found that the jejunum was torn almost completely in two. There was absolutely no blood in the abdominal cavity but there was a large amount of intestinal contents. He stood the operation very well. A cigarette drain was placed in the pelvis, after closing the rent in the jejunum. Less than twelve hours later he died. My thought is that in the absence of hemorrhage, which would give an indication of circulatory disturbance, the presence of severe and persistent rigidity of the abdominal muscles, even without other traumatic symptoms, is sufficient indication for an exploratory incision. Since then the thought has come to me that the most important evidence of rupture of stomach or bowel is the determination of pneumoperitoneum, as very definitely and very early shown by roentgenography.

Dr. Lee: One very important thing in these cases is to determine whether a condition of great depression is due to shock or to concealed hemorrhage. When the diagnosis is made, the treatment is indicated, and an exploratory operation, simple in itself, reveals all that we can possibly know. I saw two prize fighters who died, one thirty-six hours after he was hit in the kidney (from rupture of that organ and slow hemorrhage) and the other from rupture of the colon (a very rare condition).

There is a good deal I could state, but these are conditions that we have got to study, and we have got to formulate our rules so that we will know promptly whether the depression is due to shock or to hemorrhage. To one thing we must make up our minds, that is, whether we make a mistake or not, to get into those abdomens as early as we possibly can.

Dr. Ball: I had a case that falls into this group. It was in a boy who was speeding in an automobile. He took a bank and went over, and was sent in some 20 miles by car. When he came into the hospital, he had a very tense, thready pulse and there was no doubt that he had some intra-abdominal trouble. I was not

certain what it was but we operated immediately, and we found that he had at least a 3 inch fracture of the lower part of the right lobe of the liver. After getting the blood out of the liver wound, which I first felt with my fingers, I packed it very tight, and instead of bringing the drain out anteriorly I brought it out in the right flank, and then kept the boy on his right side. We got ready immediately after the operation for a transfusion, but the patient did not need it. He made an uneventful recovery.

Dr. O'Neill: It has happened to me that I have had to deal with a number of perforations, not only from trauma (in fact, the greater number were not from trauma), and I think that there is one observation especially that may be made, and that is that general rigidity, without reference to other symptoms, is a fair indication for laparotomy. If we operate in every case with general rigidity, we will be playing a much safer game. I have had 16 perforation cases brought to me in time to save every one of them. I do not mean that is all I have seen, but those were consecutive cases, and in each one of them there was rigidity.

Dr. Dickinson mentions cases where there was not that sign. Then, of course, one's judgment is on other issues.

I recently saw a man who fell from a ladder and struck his abdomen against a heavy metal table. He had just that kind of tenderness you sometimes see in early appendicitis when the rest of the abdomen is flaccid. I did not open him; he did not develop the chain of symptoms that would lead to general rigidity, and he got well; but I see very readily from cases that have been mentioned that that might have gone on; it might have been a localized hemorrhage that might have led to a subserous blood clot that could have broken and maybe put him beyond help later. However, he was a very bad risk; he was over sixty and had a goiter and a kidney condition, and I took that also into consideration.

I believe that if we operate in every case with a rigid abdomen it will save us a great deal more often than it will get us into trouble.

Dr. Dickinson: I am glad Dr. Bradley Coley brought up the question of autotransfusion. I think that is very important in some instances. Of course, we do not always have facilities at hand for pumping the blood which is found in the peritoneal cavity into vessels, and in those instances perhaps it would be a wise precaution to leave it in the abdomen.

Dr. Baker cited a case of rupture of the jejunum. If you recall in my paper I stated that very frequently in injuries to the jejunum, the onset of symptoms is delayed for twenty-four hours. His suggestion in regard to the use of the roentgen ray to determine the presence of pneumoperitoneum, I think is a very valuable one, because it will certainly show if there has been a rupture anywhere along the gastro-intestinal tract with the escape of gas.

Dr. O'Neill emphasized generalized rigidity of the abdomen. I think that is very important from a diagnostic point. There is only one thing I have to say in regard to it, however, and that is that sometimes we are a little bit thrown off our guard in these cases, which may or may not be traumatic.

Quite recently I had the experience of operating upon a man who had a gastroenterostomy. He was brought into the hospital with what I considered a general abdominal rigidity, nausea, vomiting of blood, and a rising pulse rate, and in view of his physical findings I made a diagnosis of a perforation of his ulcer. I performed immediate laparotomy and found no perforation of the ulcer, but I did find a partial obstruction, due to multiple adhesions within the abdomen.

Dr. Le Seur (Chairman): Just one thought along this same line. Someone said that it is better to look and see than to wait and see. I think that, perhaps, sums up the situation pretty well. Then another saying is that if your first incision is not in the right place, it is not in vain because it shows the necessity for a second incision and where it should be placed.

PRINCIPLES OF
THE FOURTH ERA IN SURGERY*

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DR. Thomas L. Bennett, the anesthetist who has probably had as large an experience with different surgeons as any man of his special calling, remarked to me one day that the best surgeon is the one who acts all the while when operating as though he were afraid of waking the patient up. That will be my text.

The history of surgery may be classified rather distinctly in four categories or eras.

The first or Heroic Era: A rather surprising amount of surgery was done for centuries by men who knew little of anatomy or of physiology. Even the operations of cesarean section, of trephining and of opening the bladder for stone date far back. In native African tribes today cesarean section is done under palm wine intoxication in the place of anesthesia and the same wine is used for a wound dressing. Empirical knowledge of antisepsis during the first era related to the use of alcohols and balsams before the nature of their action was known. Surgery was heroic in the days of Hippocrates, who liberated medicine from religion.

The second or Anatomical Era, anticipated by Vesalius, made slow progress because of prejudice until the days of John Hunter and then rapidly developed into the proportions of a distinct era. Students of medicine were obliged to develop a more comprehensive and refined knowledge of anatomy during that era than at any time previously or, I regret to say, since. A somewhat similar history belongs to art. There was finer drawing and perspective before the advent of the impressionist or futurist schools than there is today. At the height of the Anatomical Era it was believed that surgery had reached its limitations and Baron Larrey, Napoleon's surgeon, said that it could go no further; all that could be known about surgery was already known; the only thing left for the student of the future was to acquire what was already known and to perfect his technique.

Then came the third or Pathological Era. There was explosive advance in surgery which made a revolution of the first magnitude. It was introduced by the practical work of Lister based upon the experimental work of Pasteur. Knowledge of life history of the microbe allowed surgeons to work with such a degree of safety that many who were ill-qualified to use a knife assumed responsibilities for which they were in no way prepared by judgment, experience or learning. This was one of the vices of the third era of surgery that accompanied its virtues. Dr. Maurice H. Richardson said that it was a pity that so many patients lived after operations by men who were incompetent as real surgeons. Another vice going with the virtues of third era surgery related to the length of time which men gave to any given operation deliberately. There was too much handling of viscera and tissue without regard to false motions, each one of which unnecessarily sent a destructive impulse to the centers of consciousness of the patient even though he were anesthetized. Long incisions and disregard of the elements which are known to introduce shock were features of the third era. Surgeons forgot what they knew about values of the sense of touch and began to work more and more by the sense of sight. The basic idea in this Era related to removal of microbes and their by-prod-

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ucts without knowledge of or at least due regard for natural protective forces belonging to the individual. Destruction of microbes became developed along lines of high art but left the patient himself out. He was an unimportant and small object in the presence of the large microbe.

At the height of the third or Pathological Era many of us doubtless felt as did surgeons at the height of the second or Anatomical Era. We believed that surgery had at last really reached its limitations. Lo and behold! a wholly new era again began to surmount principles of the third era when Metchnikoff and Wright turned our thoughts toward phagocytes and opsonins.

The fourth or Physiological Era began to light up our horizon. The basic theory of the fourth or physiological era is conservation of the natural resistance of the patient, turning him over to his phagocytes and antibodies as quickly as we can do it—a period of brief anesthesia and the least degree of surgical battle that will suffice. Perhaps nothing will serve as an object lesson in this regard better than results in the surgical treatment of acute appendicitis.

During the first or Heroic Era appendicitis abscesses were opened when they pointed in the flank. The condition was known as "iliac passion." Many appendicitis patients recovered in those days after the simple opening of their abscesses. In the second or Anatomical Era of surgery these patients were still recovering at times, after either spontaneous or surgical opening of the abscess of iliac passion which had now become known as "iliac phlegmon." The fact that many appendicitis patients died under medical treatment or surgical treatment belonging to the first and second eras in surgery is of less interest than the fact that many of them recovered under medical or surgical treatment. How did they do that? They did it with their natural protective resources. That is the point. It is the point upon which the principles of the fourth or Physiological Era were developed.

With the advent of the third or Pathological Era in surgery when it was believed to be necessary to remove all bacteria and their by-products as far as possible the operative death rate in acute appendicitis surgery seems to have been greater than it was during the ignorance of the first era or the anatomical excellence in the second era.

How was it that surgeons trained in principles of the great third era were unable to manage appendicitis cases as well as they were managed in earlier days when surgeons did not know about microbes? When pondering over this paradox it suddenly occurred to surgeons that it might be well to develop the principles of a fourth era, one in which the natural resistance of the patient was conserved as it had been done by doctors of olden times. There must have been something in their ancient ideas after all!

At the time when development of the fourth or physiological era was newly under way appendicitis cases with abscesses and widespread infection were making bad showing under the great third era principles, which aimed at destruction of the microbe only. Dr. L. W. Hotchkiss was then at work in the J. Hood Wright Hospital, New York, where the average death rate in acute appendicitis surgery had been 31 per cent. He suddenly decided to accept our teaching of principles of the fourth era of surgery and then had a run of 76 patients without a death in the very same class of cases in which the death rate had previously been 31 per cent. Could anything be more impressive? Yet when this object lesson and similar ones had been quoted to a certain conservative surgeon he remarked, "I don't care anything about statistics, we must stick to principles." He continued to have a high death rate in his own operative work in acute appendicitis.

Principles of the fourth era really date back to the idea held by surgeons of the middle of the last century empirically. They were calling attention to the desirability of rapid but not hurried operation. They impressed the idea that patients

recovered more quickly when the attack of surgery had been acute. Chronic operating was deadly in its nature.

Among ancient writers there is no reference to rapid operating but it was doubtless done on the score of avoiding hemorrhage rather than on the score of avoiding shock. The old Romans made no reference to rapid operating. Celsus is the first writer on that point. He was opposed to rapid work, however, saying that the surgeon must not have compassion which will lead him to hurry. We must always remember that distinction is to be made between safe and unsafe rapidity.

In the sixteenth century Ambroise Paré favors a speedy operation but Heister in the next century goes back to the position of Celsus in a way. He states that the operator should use expedition but not hurry. Most of us will agree to that.

When we get to the English school of the anatomical era, Sir Astley Cooper does not mention rapidity of operating but concentrates attention upon knowledge of anatomy. Sir Robert Liston speaks in praise of dexterity and boldness without referring to rapidity. Bell, Lizars and other contemporary writers did not go into the matter of qualifications aside from knowledge of anatomy. Velpeau does not refer to time-saving except in the presence of syncope. Skey was one of the first to awake to the idea that the new resource of anesthesia might lead to shock because of duration of operations under the new method. "The duration of an operation may exceed the endurance of the patient," said he.

In 1772 Morand of Paris called attention to the fact that the old adage "tuto, cito et jucundo" applied to surgery quite as well as to medicine. Bardeleben one hundred years later expressed the same idea. He said, in addition, "safety is the first consideration but rapidity is a goal to be aimed at and is sometimes indispensable." Many of us remember this white-haired old surgeon and his deft manipulations at a time when no other Berlin surgeon excepting Israel appeared to care about the patient himself.

Treves in his somewhat prejudiced viewpoint in 1892 conceives of the rapid operator in the light of a player to the gallery. He gives such an operator no credit at all for trying to conserve the patient's vital energy. One gets the impression that Treves was aiming a parable at the head of some one colleague whom he had in mind, Tait, perhaps. Tait sneered at antiseptic or aseptic surgery at a time when it was close to our hearts. He presented better statistics in abdominal surgery than were presented by any other surgeon of his day who was following Listerian principles. Tait was a speedy operator through small incisions, working lightly by the sense of touch. He really did play to the gallery a bit but with a sense of humor that seemed to be directed toward Treves. Tait was depending upon the patient's natural powers of resistance which were not shocked and put out of commission. He did not know just how to state the matter in terms of physiology but called it "horse sense." Tait was a thorn in our side at the height of the third or pathological era of surgery because we could not at that time explain the nature of his discomforting success. Now, in the fourth or physiological era of surgery we understand.

In the first and second eras of surgery man was bigger than the microbe. In the third era of surgery the microbe was bigger than the man. In the fourth era of surgery we return to the position that man is bigger than the microbe.

RAILWAY ACCIDENTS
AND THEIR COMPLICATIONS*

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ALTHOUGH accidents occurring in the railway service cover almost the entire field of traumatic surgery, yet there are certain types of injuries that recur with surprising frequency. It is to this group, with their complications, that I shall confine my discussion.

Head injuries constitute a large percentage of wounds following the derailment of passenger coaches. Fracture of the skull and disfiguring lacerations about the face present problems that tax the surgeon's skill and ingenuity. Following a recent accident, occurring in Northern New England, 32 patients were admitted to one hospital, and of this number 10 were suffering with some form of head injury. Perhaps there is no field where skilful surgery is of such paramount importance as in facial injuries. It cannot be stressed with too much emphasis that conservatism in this area will be amply repaid by cosmetic results and by the grateful appreciation of the patient. Nature, if given a chance, will be of great assistance to the surgeon. Cases have been reported where ears have been almost entirely avulsed, and yet, when sutured in place, have entirely healed with little or no deformity.

A short time ago a young, unmarried woman entered a Vermont hospital with the lower end of her nose resting on her chin, as it dangled by two small pedicles of skin. She was immediately taken to the operating room and anesthetized, and the nose fragment was sutured in its original position. Fortunately, the wound healed by first intention. Six months later, when she returned to extend to her surgeon a personal invitation to her wedding, only a purple line marked the former separation.

Fracture of the skull, with or without compression, is not uncommon. This class of cases presents a serious problem, and all should be hospitalized. A fine degree of surgical sense is required in the treatment of the condition. Among the more striking results that may persist, even after operation for decompression are dizziness, headache, impaired vision and hearing, and localized paralyses.

Fractures of the vertebrae are of serious importance. In the vast majority of them laminectomy is necessary to remove pressure on the cord. The mortality in this group is extremely high, and even if the patient does get well the hospital stay and subsequent convalescence are quite prolonged.

Passing mention is made of fractures of the extremities, although they form a sizeable group of all serious railway accidents. Here is a field in railway and industrial surgery where failure on the part of the operator is of serious consequence to all concerned. The treatment of these types of fracture is coming to be more and more standardized, but it would be impossible, in a paper of this kind, to discuss it in detail.

Shock is a condition that demands immediate and effective measures. As soon as the patient arrives at the hospital every effort should be bent toward the restoration of the normal functions. All authorities agree that heat and the administration of liquids are the two best methods now at hand. Perhaps there is no place where transfusion of blood produces such brilliant results as in shock caused by sudden hemorrhage. This has been clearly demonstrated in accidental amputations

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where the patient loses considerable blood before reaching surgical assistance. Although it is safer to type the recipient and to have both donor and recipient in the same group, one should not wait for this when it is a question of life or death. A member of Group IV (universal donor) should then be utilized, and from 400 to 600 c.c. of blood transfused at once. Clinical findings later determine the necessity of subsequent transfusions.

In any disaster failure to provide the press with a complete and accurate list of the dead and injured, at the earliest possible time, is a non-medical complication which immediately brings forth a storm of adverse criticism. While the hospital staff concerns itself with the surgical work at hand, it is the duty of the surgeon in charge to complete a survey of the patients entrusted to his care. The list should include the patient's full name, his address, occupation and the nature of the injury sustained. While this extrasurgical activity may seem of no importance, yet experience has demonstrated that it is the quickest way to get information to relatives and friends who are anxiously awaiting news.

Of the every-day accidents, foreign bodies in the eye are about as frequent a cause of office consultation as the railway surgeon has. This is particularly true of the men who are working in the shops, and also of train crews. In the former, bits of steel are not uncommon, while in the latter cinders are the usual offenders. The sites of lodgment are underneath the upper lid and within the cornea. Most of these foreign bodies, when removed, cause no further trouble, but occasionally an ulcer of the cornea develops. This may result in impaired vision if it is at all deep.

The individual who consults a doctor for an injured hand is entitled to the highest degree of diagnostic skill and surgical ability. Many surgeons lose sight of the fact that the working man's hands are the sole means of maintaining him and his family in the economic sun. The earning capacity of the average working man is directly proportional to the functional activity of his hands. In their desire to obtain cosmetic results, operators are prone to wantonly sacrifice fractional portions of fingers. The practice should be heartily condemned, as Nature, if the opportunity be given, will restore this damaged tissue with healthy granulations.

The infected hand is another problem of serious concern to the surgeon because of its possibilities. No attempt will be made to discuss the condition as the program offers a paper on this subject.

Burns do not constitute a high percentage of railway accidents but are important. Engineers, firemen and hostlers are subject to the hazards of live steam and often seek treatment for burns of the exposed parts of the body. The multiple uses of gasoline and electricity result in numerous burns. For small, superficial burns, over a limited area, the use of wet dressings has proven successful. However, where there is any considerable amount of burned surface, wax sprayed over the damaged tissue, after the blebs have been opened and dead tissue carefully removed, has proven a decided advantage over other methods. The dressings are changed daily, wax being freshly applied each time. In determining the prognosis of patients suffering with severe burns, it is a well-known fact that the extent of the body area involved, and not the depth of the burn, is the deciding factor. Cases in which more than 50 per cent of the surface area is burned, as a rule, have a fatal termination, the body being overwhelmed by toxemia.

Surgeons living in the northern tier of states are confronted with the problem of exposure when accidents occur in the winter months. Several years ago a Pullman sleeping coach was derailed and became partly submerged in the icy waters of Lake Champlain. Although it was 25° below zero a few frost-bitten extremities, and some "colds" were the extent of the disabilities. Fortunately, few pneumonias develop, although the possibility of such a

complication gives the surgeon much cause for worry after this kind of an accident. The usual routine carried out in an accident at this time is the rapid evacuation of patients to the nearest hospital. Again resort is made to the utilization of heat and the administration of hot liquids.

Open wounds about the body are of frequent occurrence. Their treatment consists in the mechanical cleansing of the parts, the application of iodine or mercurochrome and the use of Dakin's solution. Sometimes it is impossible to obtain the regular Dakin solution, but the application of a simple, boric acid wet dressing will tide over the emergency. Eusol, consisting of an ounce each of boric acid and chlorinated lime to the gallon of sterile water, is an English formula developed during the War. Its use and action are similar to that of Dakin's solution, although the latter is by far the better preparation as the caustic alkalies have been removed.

The prophylactic use of tetanus antitoxin, as a routine measure, has almost entirely done away with lockjaw. As prepared by most pharmaceutical houses, 1500 units is the usual preventive dose. If, however, the infection does develop, the combined intraspinal and intravenous administration of large doses of the antitoxin offers the best chance of saving the patient's life. In order to reduce to a minimum the danger of anaphylactic reaction, all the tetanus antitoxin should be given within nine days after the onset of symptoms.

The Workmen's Compensation statutes enacted by the various state legislatures have greatly reduced litigation between the railroads and their employees. However, in accidents where passengers are involved, medicolegal complications almost invariably arise. Those concerning injuries of a minor character can usually be disposed of without difficulty. Cases that require hospitalization come under a different classification. On some roads a decided effort is made to impress the patient that there is no connection between the surgical staff and the claims department. The majority of the roads have never established any definite policy along this line.

Personal observation has proven to my satisfaction at least, that the surgeon in immediate change of the case may be the means of avoiding unnecessary and expensive lawsuits. Contact between the patient and a representative of the Claims Department, sometimes prior to his hospital discharges, impresses the injured person with the fact that the railroad is interested in his case. A friendly word of advice or the arbitration of a dispute over a few hundred dollars difference between the patients' claim and the railroad's offer is oftentimes the surgeon's opportunity to effect a signed release in an otherwise troublesome case.

Discussion

Dr. J. P. G. Cummins: In regard to shock I think we are all agreed that the sooner the patient is gotten into a warm bed and warm blankets, given hot coffee, hypodermatoclysis, blood transfusion, etc., the better; and we should not lose sight of the fact that an early dose of morphine aids very materially in transportation and lessens the blow given to the tissues.

In regard to hands, all of us who were at Dr. Moorhead's clinic yesterday, I am sure, will remember it as long as we live. We have all had trouble in getting an extension of the terminal phalanx, for which he gave us a very practical suggestion, traction by a linen suture passed through the end of the finger nail and back over the end of a miniature Thomas splint, made with your pliers and a little wire out of your automobile.

In dressing injured fingers, especially the finger that is clipped off with the terminal phalanx or any other portion of it, instead of sacrificing more bone to get flaps, I have for many years been using strips of adhesive plaster, not put on in shingle fashion but in lattice work. In using the adhesive sterilize it immediately. Put on a little pledget of cotton; moisten it with alcohol or, in the absence of alcohol, with spirits of camphor; sterilize the adhesive strips and put them on. There are two reasons for this procedure: one is that that stump will grow out and cover over the bone

and the other is that the dressings are painless. You also save time by it. It is very disconcerting in some of these compensation cases for the patient to see his friends receive a good verdict from the referee for damages, while his finger appears to grow and does actually grow.

Dr. McSweeney spoke of injuries to the face, including the ears. I recall a lady who was caught in a road cart; the horse ran down a rough mountain side and she was dragged, and all that remained of one ear was a little portion of the cartilage which was attached to her head. By cleansing that, scraping the sand and dirt out of it, that ear grew back to the head. Many of these tissues can be saved. They can be cut off later, if necessary, but I think the cartilage of the ear itself shows, perhaps, more vitality than any other portion of the body.

Fracture of the nose also should be remedied immediately, providing the condition of the patient is such it can be done, and in reducing fractures of the nose a method that I have found practical is to put into the nose the lubricated beak of a large sound. Using the long shank as a lever you can mold that nose into any position you wish. Run your sound through so that you will know that the air passage is not obstructed. Repeat that on the other side if it is indicated, and you will be surprised how easy it is to reduce these fractures.

A Member: I would like to ask the gentleman how well the circulation was maintained in the ear that was replaced.

Dr. McSweeney: In one of these cases, the ear was almost avulsed. It was torn from the scalp and was hanging by a little skin at the lower end of the lobe. The other case was that of a man who had also sustained a fracture of the skull. In the first case, I sutured the ear back onto the side of the man's head, and at the end of fifteen days it was completely healed. The resultant scar was only an indistinct line. In the settlement of the case, there was a difference of $1,000 between him and the adjuster. After several hours of controversy they came in and laid the situation before me. I advised a compromise to which they agreed. The patient left the hospital satisfied, and the Claim Adjuster marked the case closed. Here was a case that might have cost the railroad a large sum of money, had the settlement not been made at this time.

Same Member: What I had in mind was whether that ear maintained the warmth of the other ear, or whether that ear was lost to the man because of freezing, etc.

Dr. McSweeney: I am unable to answer that question, as the patients returned to their homes in different states.

(This concludes the transactions of the New York and New England Association of Railway Surgeons' Thirty-Sixth Annual Meeting.)

TORSION OF THE SPERMATIC CORD IN AN INFANT

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CHICAGO, ILLINOIS

ABOUT two years ago[1] I reported two cases of torsion of the spermatic cord in adults and reviewed the literature up to that time. The condition, though not rare, is of surgical interest especially because acute torsion may be, and very often is, mistaken for strangulated inguinal hernia. Correct preoperative diagnosis, however, is not of importance as either condition calls for immediate surgical treatment.

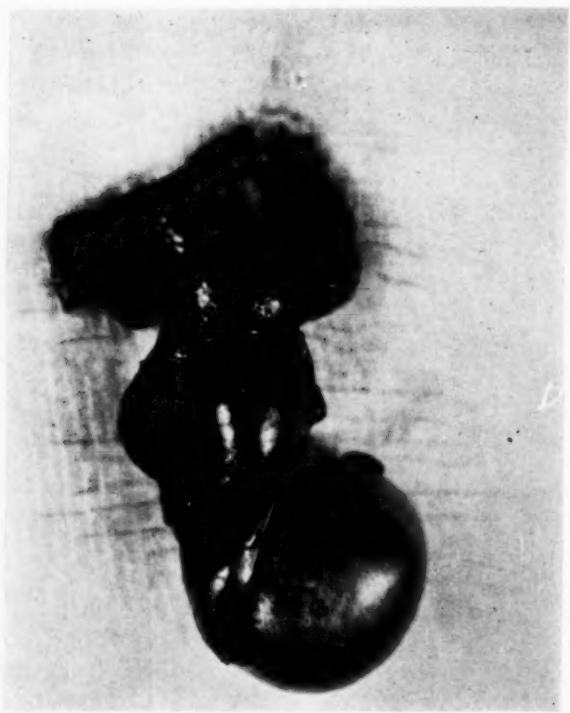

FIG. 1.

The subacute and chronic types of torsion may simulate the symptoms of epididymal tuberculosis, especially if the patient has any history of phthisis. As Legue[2] has remarked in a recent discussion, it is desirable to make an early correct diagnosis in order to carry out a conservative operation. At the first signs of torsion the testis can be fixed, but if tuberculosis is suspected the organ may be removed.

The great majority of cases of torsion of the spermatic cord occur at about the age of puberty, or later. It is comparatively rare in infants, and with such very young patients a clinical diagnosis is less likely to be made than in an adult. I have recently operated on such a case in the American Hospital of Chicago.

CASE REPORT

The patient was a fairly well-developed and nourished child, aged six months, who was admitted to the hospital on November 5, 1926, referred by Dr. Boris Berkman.

The child had had measles and whooping-cough.

The present illness began three days before Dr. Berkman brought him to the hospital, with vomiting, difficulty in retaining food, difficult defecation, and tenderness in the left lower abdomen.

Physical examination disclosed nothing of consequence except in regard to the abdomen, which showed some tenderness and rigidity throughout. There was pain to touch, more especially in the left inguinal region, with tenderness and swelling over the testicle and inguinal canal. The testes were fully descended.

A diagnosis of incarcerated inguinal hernia was made, and operation was decided upon.

An incision was made over the tumor in the left inguinal region; the tissues here were found much inflamed and swollen to the size of a thumb. On opening the canal the spermatic cord was found to be thrombosed, and the normally developed testis bluish-black in appearance, its vessels all congested and partly gangrenous. The vessels of the funiculus spermaticus were markedly thrombosed; the entire cord was acutely inflamed and twisted three

times on its own axis. The vas deferens was also congested, discolored and distorted.

As attempts at detorsion failed to restore circulation, the entire left testicle and cord were removed. The inguinal canal and external wound were closed. The child made a good recovery and left the hospital in excellent condition.

The accompanying illustration (Fig. 1) shows the gross condition of the organs as found at operation.

COMMENT

This case calls for no special comment, the general facts being in accord with the findings in similar reported cases. I am unable to offer any explanation regarding the mode of onset of the torsion in this case, as there was nothing abnormal in the anatomy of the organs as far as was observed.

In my previous paper I referred to more than 150 cases reported in the general literature. Since that time I find that cases have been reported by Escat,[3] de Vernejoul,[4] Massa[5] (two cases), Gutierrez,[6] Odasso,[7] Pagliere[8] (two cases), Nowland,[9] Sarmiento,[10] Sandberg,[11] Loubat and Mondain,[12] Capponago,[13] Irk[14] (two cases), Hamilton,[15] Petridis,[16] Day,[17] and Iselin.[18]

Hirsch[19] reported a case diagnosed as torsion of the spermatic cord, which on operation proved to be a tuberculous epididymis.

Nowland's and Day's cases were in infants. In Nowland's case the child was only nine days old, and the condition was associated with phimosis and congenital inguinal hernia. At operation the testicle was found extremely gangrenous and an orchidectomy was necessary. The child made a good recovery.

In Day's case the child was three months old and the testicle was ectopic. This case was diagnosed as strangulation of an ectopic testicle. At operation the right spermatic cord was found twisted "several times," and the conditions necessitated orchidectomy.

In the cases also of Odasso, Capponago, and in one of Irk's cases, the testicle was ectopic.

In the cases of Escat, de Vernejoul, Sarmiento, one of Irk's and Pagliere's two cases the torsions were intravaginal. In Irk's case there was torsion *en masse* of the testicle with the vaginal torsion, the latter enclosing a hydrocele and a loop of small intestine.

The general etiology and clinical features of torsion of the spermatic cord have been discussed in my previous paper and it would be redundant to repeat them here.

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A MASTOID SUCTION-WIPER

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NEW YORK CITY

OBSERVATION over a period of years of the technique for mastoidectomy used by a number of surgeons both here and abroad gave me the impression that sponge-wiping of surgical wounds, and particularly those of bleeding, bony surfaces such as are encountered in mastoidectomy, radical frontal sinus operations and other osteoplastic procedures, does not provide the simplicity, facility or satisfaction that suction methods offer.

Those who from time to time are forced to accept the help of untrained assistants or inexperienced interns appreciate the annoyance and the delay frequently encountered under such conditions. The use of sterile gauze wipes, while simple enough, entails a certain degree of skill and a knack secured only by considerable experience.

Not infrequently the assistant is in the operator's way more than he is a help, and the time used to exert firm pressure of a gauze mastoid wipe and its removal is often two or three times as long as needed; so in using four or five dozen wipes during a single operation, if only three or four seconds are lost in the handling of each sponge, a delay of many minutes is sustained, which in certain cases contributes to the shock of the operation, and also causes frequent momentary interference with the surgeon's manipulations.

In order to avoid this delay and to maintain a constantly clear and unobstructed vision of the operative field, not possible with sponge-wiping, I devised, in 1924, a simple mastoid suction tip which I have called a "mastoid suction-wiper." It acted so satisfactorily that I requested the George P. Pilling & Son Co. to make an improved model, an illustration of which is given (Fig. 1).

I did not consider the device of much moment aside from finding it of value in my individual work.

Davis and Cushing[1] and Hahn[2] advocate the same method. Hahn states that "suction methods are an improvement over sponging in intracranial operations."

I also found suction methods far superior to sponge-wiping of bleeding bony surfaces and can recommend it most highly to otologists, orthopedists, neuro-surgeons and others whose fields involve osseous wounds.

Description. The mastoid suction tip (Fig. 1) that I use consists of a stiff tubular shaft (A) bent somewhat S-fashion. At the distal or suction end (B), the tube "flares" into a somewhat flattened bell shape, in the end of which, and with its longest diameter running transverse to the long axis of the curved shaft, is a slot-like opening (C) leading up into the round channel of the tube. A short distance from the suction tip end, the tubular shaft on its inferior concave border is attached to a ring-like spring-clip band (D) through which the surgeon passes his middle or index finger (Fig. 2), the ring fitting its circumference sufficiently snugly to give a firm grip. At the proximal end (E) the tubular shaft terminates in a bulbous extremity over which the rubber tubing is slipped, the latter connecting with the bottle of the suction pump apparatus.

The first assistant wears a similar suction tip which, however, he carries on the distal phalanx of his right index finger.

Technique. The first assistant is instructed in the proper use of the mastoid suction-wiper before the operation. This is so simple that much less difficulty is

[1] Davis, L. E., and Cushing, H. Experience with blood replacement during or after major intracranial operations. *Surg., Gynec. & Obst.*, 1925, xl, 310–322.

[2] Hahn, E. V. Notes on the Davis and Cushing method of salvaging blood during major intracranial operations. *Surg., Gynec. & Obst.*, 1925, xli, 107–108.

experienced than in instructing him in sponge-wiping.

The suction-wiper and the rubber tubing leading to the suction bottle are sterilized by boiling, and the rubber-gloved terminal phalanx of the right index finger is passed through the ring of the instrument, which fits the finger snugly.

Immediately before the operation begins, the suction apparatus is tested by immersing the end of the suction tip in sterile normal saline or 2 per cent sodium citrate solution, a small bowl of which is at hand during the operation for frequent immersion of the tip to keep it free from blood clots.

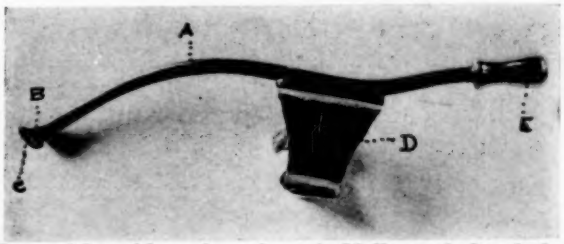

Fig. 1. Mastoid suction-wiper. A. Hollow tubular shaft; B. Distal flattened end; C. Slot-like opening; D. Spring-clip circular band; E. Proximal bulbous end for attaching rubber tubing from suction bottle.

The assistant stands opposite to the surgeon and at the beginning of the operation, from the skin incision to the completion of the osseous excavation, he dexterously applies the suction-tip to the blood-flooded field, a simple flexing motion of the finger bringing the suction end of the instrument to the bleeding area. By a somewhat sliding motion along the wound, in either a longitudinal or horizontal direction, for which the flattened shape of suction-tip end is admirably adapted, the entire field can be kept practically bloodless from the beginning to the end of the operation.

The surgeon himself will quickly become adept with the device as he finds that it does not interfere with the use of either the rest of his fingers or the hand, or with manipulation of instruments, whether scalpel, gouge, forceps, or bone mallet. Thus, at a particularly important instant, when the assistant may be occupied with some other detail, he has the additional advantage of being able to perform his own "sponging" at a particularly desired point without any loss of time.

In those not infrequent cases of mastoiditis where considerable free pus wells up into the osseous wound upon removing the cortical layers, one can immediately suck away by means of this device not only the freely flowing pus that might contaminate uninfected areas, but also loose or semi-detached granulations, minute bone particles, etc., which are quickly and readily carried away.

Fig. 2. Mastoid suction-wiper attached to index finger of right hand by means of spring-clip circular band (D). It may be worn on the middle finger. Note that index finger and thumb are free to grasp other instruments.

In the case of free pus, as soon as all in view is sucked away, a freshly sterilized suction tip should replace the soiled one.

In such cases where the brain plate or sinus plate has been accidentally injured or there is reason to believe the dura or sinus is diseased or exposed by disease, the suction-tip end makes an admirable diagnostic instrument.

This suction tip has proved of great value in radical frontal and maxillary sinus operations, helping to maintain a

field free from obscuring blood, pus and débris, not nearly so easily accomplished by sponge-wiping.

My chief object in publishing a description of this device is to recommend the principle of suction most highly to those who as yet have not tried what has proved to be a most valuable "silent assistant."

I heartily concur with Davis, Cushing and Hahn in the superiority of suction over sponge-wiping in cranio-osteal surgery and earnestly commend its trial by osteoplastic as well as aural surgeons.

A GENITAL SUPPORT FOR PERINEAL OPERATIONS

CHARLES J. DRUECK, M.D.

CHICAGO

THE external genitals of a male patient prepared for a rectal operation often embarrass the surgeon by slipping out of the sling bandage with which they are supported. In our service an ordinary small towel has served our purpose admirably. When the patient, prepared, is placed in position, one border of a small towel is raised along the perineum to the base of the scrotum and is drawn snugly around the genitals at the pubes where it is grapsed with a hemostat (Fig. 1). The lower free border of the towel is then raised and spread upon the patient's abdomen under the other sterile covers (Fig. 2). Should occasion demand the introduction of a urethral sound no disarrangement of the dressings is necessary.

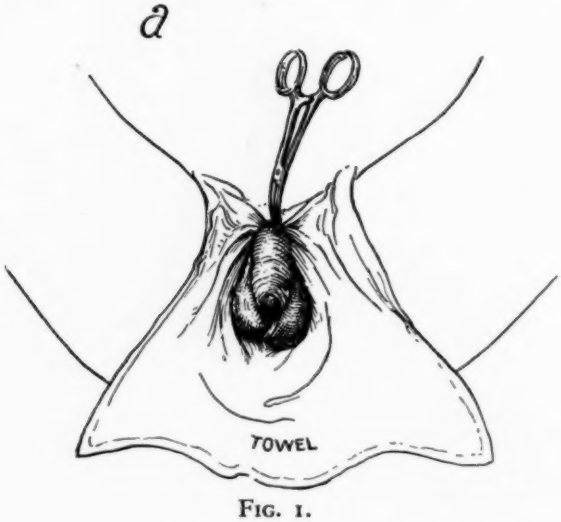

FIG. 1.

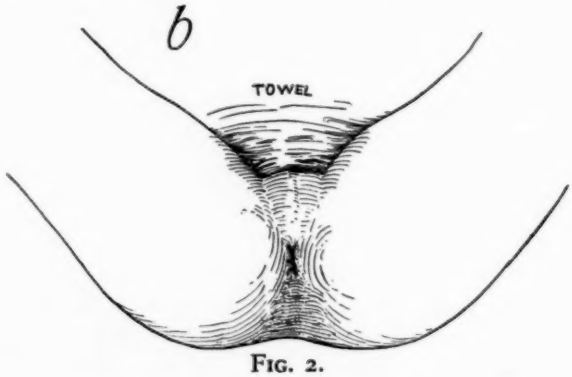

FIG. 2.

EDITORIALS

GAS BACILLUS TOXEMIA IN INTESTINAL OBSTRUCTION AND PERITONITIS

RECENTLY discussing gas gangrene[1] we mentioned that Prof. H. Vincent, of Val-de-Grace, has urged the use of polyvalent gas bacillus antitoxin in the treatment of all phlegmons produced by anaerobic organisms, including para-intestinal suppurations, such as those of appendicitis. For several years some of the French surgeons have, indeed, been using mixed anti-gas-gangrene sera in "gangrenous appendicitis" cases, with what has been interpreted as a considerable reduction of mortality. In these cases the Welch and other gas-producing bacilli that may be found in the neighborhood of the appendix are probably secondary invaders from the bowel, where they are often to be found normally in moderate numbers. Under certain conditions, however, these bacilli may proliferate in the intestine; and it is in this connection that an hypothesis quite worthy of serious consideration and investigation is presented by B. W. Williams of London.[2] This hypothesis is that the toxemia of ileus, whether a mechanical obstruction or the intestinal paralysis of peritonitis, is the toxemia of gas-forming organisms, especially bacillus welchii.

Williams calls attention to a striking similarity between the systemic symptoms of gas gangrene and those of ileus: repeated vomiting; cold nose, ears and extremities; rapid, thready and then imperceptible pulse; clear mentality and euphoria. He finds that in intestinal obstruction there is an enormous proliferation of anaerobic bacilli in the stagnant alkaline contents of the small intestine. By injections into mice, protected and unprotected by Welch bacillus antitoxin, of filtrates from the contents of obstructed loops of small bowel (human and dog) he has, he thinks, produced evidence of the presence in such bowel of Welch bacillus toxins. Certain changes he has found in the hearts, great vessels and livers of patients dying of peritonitis and of acute obstruction are compatible with absorption of bacillus welchii toxin. He has had high titered bacillus welchii antitoxic serum (English) administered in cases of general peritonitis and of intestinal obstruction, with a much lower mortality than in previously treated cases of the same kind, operated upon by the same surgeons and in the same (St. Thomas') hospital.

In the complicated, teeming flora of the stagnant intestine, bacteriological studies are manifestly difficult, and conclusions must be drawn with caution. Williams appreciates this and also the pitfalls of clinical tests. He recognizes that there are gaps between theory, reasonable presumption and conclusive demonstration. Nevertheless, he has presented an hypothesis that needs give us pause, and sufficient painstaking observations to make that hypothesis worthy of further laboratory and bedside tests. If gas bacillus antitoxin will overcome the toxemia of paralytic and of mechanical ileus, we can manage surgically diffuse peritonitis and obstruction with much better prospects of cure. It would be quite like the use of insulin in many threatening complications of diabetes: with it the surgeon is master of the situation; without it his patient is very apt to succumb. If, however, the toxemia of ileus is that of gas-producing bacilli, probably the Welch organism is only one of several that are active and

[1] AM. J. SURG., N. Y., October, 1926. n.s.,i, 228.

[2] Williams, B. W. Importance of toxemia due to anaerobic organisms in intestinal obstruction and peritonitis. *Brit. J. Surg.*, Bristol, Oct., 1926, xiv, 295.

mixed antitoxic sera would be more potent than the antitoxin of the Welch bacillus alone. Which brings us again to lament that we have in this country no mixed gas bacillus antitoxic sera!

W. M. B.

A FORGOTTEN GERMAN MASTER OF SURGERY

Until the end of the first quarter of the twentieth century, the surgery of the Renaissance period had seemed a terrain so well explored and surveyed that few of us would venture to go beyond the well-considered judgments of such masters as Gurlt or Malgaigne or Allbutt. The bright particular stars in this firmament: Paré, Franco, Paracelsus, Würtz, Tagliacozzi and Clowes, are well known to all members of the surgical guild, and their writings have long since been analyzed and appraised by the authorities mentioned. But in 1925, Dr. Walter von Brunn, the accomplished historian of Rostock, published a text[1] of such basic importance that it will necessitate a certain revision of values. This text is the "Practica Copiosa" of Caspar Stromayr, a herniotomist and cataract coucher of Lindau, who completed his manuscript in 1559, one year before Fabry of Hilden (1560–1634), the "father of German surgery" was born. Little or nothing is known of the life and achievement of this *magister ignotus*. As his editor says with entire justice, he would long since have taken his place beside Paré and Franco but for the fact that his manuscript lay unnoticed, like the Sleeping Beauty in the fable, for nearly four centuries, in the city library of his native town. It was not until 1909 that Pastor Wolfart, the late city librarian of Lindau, made a fleeting reference to it in his history of the city, which he followed up with a lecture on early wound-surgeons and barbers, based upon Stromayr's text, and delivered in Lindau and Augsburg. The manuscript of this lecture has been lost. In April, 1910, however, Sudhoff had the Stromayr MS. sent up to his Institute to be photographed, but there it lay for over another decade, until Dr. von Brunn, at Sudhoff's instance, took it up and brought it to the attention of the Rostock Medical Society in the autumn of 1923 and of the Congress of German Naturalists and Physicians at Innsbruck in September, 1924. The somewhat insignificant fragment on the eye had meanwhile been published, with three of the colored drawings, by Greef and von Haselberg in Graefe's *Archiv.*[2] Of the original manuscript, which he was privileged to exhibit at Innsbruck in 1923, von Brunn says that it might have been penned yesterday, so dead black is the ink, so sharply etched the handwriting and delineation, so fresh and bright the colors of the hand drawings. This unknown surgeon was a very skilful artist.

Stromayr belonged to the class of "incisors" or wandering surgeons, who at length settled down in some community to practice their art and "live happily ever after." Some of these vagabond or barber surgeons were reckless, unscrupulous charlatans, it is true, but out of their class came Paré and Franco, and of them Hirschberg has said: "It was at the hands of the unlettered wound-surgeon and barber, a mechanic in the most literal sense, that surgery and practical ophthalmology attained a new birth and to me, the outstanding fact about these men is that they wrote, not the Latin of the learned, but their mother tongue." Or as Allbutt has expressed it: "It was out of the mouths of barbers and cutters that medicine breathed her lowly message to her children."

The manuscript is a handsome layout of 195 pages of clear, neat chirography, with 151 full-page colored drawings, bound

[1] Die Handschrift des Schnitt- und Augenarztes Caspar Stromayr in Lindau im Bodensee. In der Lindauer Handschrift (P. i. 46) vom 4. Juli 1559. Mit einer historischen Einführung und Wertung von Dr. med. Walter von Brunn. xxvii, 194 pl., 1 l., 168 col. pl. 4°. Berlin, 1925.

[2] Greef and von Haselberg. Bruchstücke einer unveröffentlichten deutschen Augenheilkunde von Bartisch von Königsbrück. (Von Caspar Stromayr.) *Arch. f. Augenh.*, Wiesb., 1913, lxxv, 117–126.

in the characteristic parchment of the sixteenth century. The bulk of the manuscript is on hernia, with an appendix on cataract, followed by additional observations on hernia and an insignificant tract on the anatomy of the eye, illustrated with pictures from the German Vesalius ("Anatomia Deutsch") of 1551. In the original manuscript, the pages are not numbered and the pictures are interspersed. The pages were subsequently numbered by Sudhoff, and the pictures segregated at the end by the editor, with footnotes indicating their location. Apothecaries' measures and Arabic numerals have been substituted for the medieval equivalents.

It appears, from the scholarly introduction of the editor, that the operation for hernia was bungled with appalling frequency by the strolling incisors, for the outlines of technique in the medieval textbooks were hazy and inadequate, while the attitude of the greater surgeons was conservative and sometimes safeguarded by legal contracts guaranteeing their immunity, if the operation failed when performed upon a great noble. Thus one enterprising cutter is known to have castrated no less than 200 children in Breslau alone, and, even in the eighteenth century, a French bishop found 500 children similarly mutilated in his district. Castration was, in fact, the crux of the whole matter. Saliceto and Lanfranc urged as best they could against the barbarous procedure. Guy de Chauliac, whose attitude toward surgery was not practical but literary, said that the operation was not possible without castration. Paré, always splendidly human in such matters, prescribed the truss in place of the *point doré* (tight binding with gold wire), but his invention was not particularly efficient or satisfactory. Parents wantonly sacrificed their children to the incompetence of rascally vagabonds, but some incisors, notably the Norsini and Preciani in Italy, were conservative and honorable and transmitted their method from generation to generation. To this class belonged the Provençal surgeon, Pierre Franco, of whom Nicaise said, "He did more for hernia, stone and cataract than Paré."

The merits of Stromayr are that, independently of Franco, whose treatise on hernia was published in 1561, he devised and wrote down a complete set of technical directions for operating on inguinal, scrotal and femoral hernia, to which he added directions for treatment of tumors of the testicles, hydrocele and prolapse of the uterus, with particular chapters on the regional anatomy, instrumentation, trusses, wound-drinks, wound infections and the like. Some twelve pages and twelve plates are devoted to the preparations for the hernia operation, which included shaving the parts, bathing the patient, adjusting him to an operating table of steep inclination, fixing the fee, prayers and binding the patient, whose arms and legs were then firmly grasped by two muscular assistants, while a third assisted the surgeon at the wound. In the ensuing operation, testes and spermatic cord were isolated *en masse*, ligated, excised and subsequently burned, along with the sac. The nine pages on hemostatic measures indicate the hopelessness of grave hemorrhage before the days of the ligature. Wound-drinks were non-alcoholic and designed only to still thirst. In the illustrations, each of which is capped by a quaint rhymed distich reminding us of Longfellow's translations from Friedrich von Logau, we get a rewarding sense of the facial expression, physique, costumes and social status of the small-town people of the German Renaissance, as well as of the colorful interiors, with their tiled floors, translucent windowpanes, arched doorways, plate-rails and high-backed bedsteads. In the operating scenes, the patients are represented as yelling lustily. The anatomical pictures are frankly naked, and in some cases, e.g., the goitrous gardener on page 217, the occupation is indicated. The uterine procidentia, e. g., in the buxom dames on pages 330–334, is

depicted with highly colored realism. Some of the faces have still the cryptic, wall-eyed expression made familiar to us by the medieval artists, but most of the figures represent jocund, self-assertive Renaissance people. The work is thus of enormous cultural and historical value and will doubtless prove itself a standby for showing students just how surgery was done in the sixteenth century.

The section on cataract describes the condition but not the operation, which, up to the time of Daviel, was technically that of the ancient Hindu couchers. In this contribution, however, Stromayr antedated Bartisch (1583). Whether he actually wrote down his book on hernia before Franco is unknown. In any event, he now takes his place as one of the outstanding contributors to Renaissance surgery, worthy of record in all subsequent histories of the subject. If, through the long centuries in which his book lay asleep, his spirit may have murmured, with Browning's unknown Florentine:

"So, die my pictures! surely, gently die!"

They were neither blackened "in the daily candle-smoke," nor fated to "moulder on the damp wall's travertine," and now assuredly this genial artist-surgeon has come into his own.—F. H. Garrison.

ANNOUNCEMENTS

Surgical Suggestions: With the establishment of the Journal in 1905 we inaugurated an editorial department of "Surgical Suggestions," consisting of a page each month of "practical brevities in diagnosis and treatment," terse bits of information or advice, not pretentious of originality but based on actual observations by members of the editorial staff. These "diagnostic hints and therapeutic wrinkles" at once appeared to have a large appeal, for they were very widely quoted in medical journals throughout the United States and Canada and when, at the end of a year, they were reprinted in a small book, it had a large sale. In 1907 a larger edition, "500 Surgical Suggestions," was generously received by readers and by reviewers, as was "700 Surgical Suggestions," reprinted in book form in 1909. Of this, a German edition, "700 diagnostisch-therapeutische Ratschläge für die chirurgische Praxis," was prepared, with consent, by Dr. Ernst Schümann of Dresden, and published by Barth of Leipzig. By 1911 a thousand or more of these paragraphic surgical observations had been published in the Journal, and "1000 Surgical Suggestions" then appeared in book form. Of this there was an unauthorized translation into Polish, and in 1914 we gave permission, upon request, for translation into Russian. Whether a Russian edition ever appeared, or the outbreak of the War interfered with its preparation, we do not know.

After fifteen years' editorial respite from the preparation of these random observations, we are starting in the next issue of the Journal a second series of "Surgical Suggestions," in the belief, fostered by our earlier experience with them, that the most serious readers like to turn now and then from longer publications to paragraphic or epigrammatic bits of information, and that even the most seasoned surgeons sometimes find useful hints in the tersely stated observations of others. If the new series of Suggestions meets with some measure of the favor with which the older series was received, we shall feel that they serve their purpose.

The Section of Genito-Urinary Surgery of the New York Academy of Medicine at its December meeting adopted the Journal as the medium for the official publication of its scientific transactions. Since many of the papers presented before this Section are by prominent urologists from various parts of the country, these transactions, which we shall publish, as nearly as possible, currently with those of the Section of Surgery, will have far more than a local interest. *The New York Urologic Society* has also selected the Journal as the medium for the publication of its transactions. *The Section of Orthopedic Surgery of the New York Academy of Medicine* has

followed the lead of the Sections of Surgery and of Genito-urinary Surgery, and we shall publish its transactions beginning with its meeting of February, 1927.

The Transactions of the New York and New England Association of Railway Surgeons so far as they are embraced by the papers read at the last annual meeting (October, 1926) and their discussion are published complete in this issue of the JOURNAL.

Index to Volume I. In the December number the Index was separated from the JOURNAL by a title-page which, unfortunately, was folioed in, and the first page of the Index was numbered 421. In binding, subscribers should remove the title page to the front of the volume, and renumber the Index pages 419 to 423, instead of 421 to 425.

Beginning with Volume II there will be, in addition to the Index, a Table of Contents which may be bound in front of the volume with the title-page.

BOOK REVIEWS

PLASTIC SURGERY OF THE HEAD, FACE AND NECK. By H. Lyons Hunt, M.D., L.R.C.S. (Edin.), Licentiate of the Royal College of Physicians, Edinburgh; Licentiate of the Faculty of Physicians and Surgeons of Glasgow; Late Captain, M.C., U.S.A.; Consulting Plastic Surgeon, Midtown Hospital, New York City; Consulting Plastic Surgeon, Lexington Hospital, New York City; etc. 8vo. Pp. 404; 342 engravings and 10 colored plates. Price, $7.00. Philadelphia and New York: Lea & Febiger, 1926.

Following the facial mutilations of the recent war, a great demand arose for the development of a type of specialized surgery which at least in a measure would rehabilitate the unfortunate sufferer and permit him to carry on without the extraneous handicap of facial disfigurement. The work of the great plastic surgeons, among them Gillies, Dufourmentel and Davis, has been such as to establish methods applicable alike to the problems of civil life as well as to those arising from the battlefield.

In a very excellent little work on the subject of plastic surgery of the face, head and neck, the author has outlined the principles to be employed in meeting the problems of cosmetic surgery. There are chapters on the character of the skin, the anesthetic to be used, the question of grafts and transplants and the treatment of wounds made in the pursuit of cosmetic results. The various chapters on the surgery of the different parts of the face, head and neck are preceded by brief reviews of the anatomy of the involved parts. Subsequently, the indications for operation and the nature of the operation advised are given with quite some detail. The volume is profusely illustrated and the bibliographical references are given at great length at the end of each chapter. This volume is a very timely, very well written and all in all very welcome addition to medical literature.

LEHRBUCH DER SPEZIELLEN CHIRURGIE FÜR STUDIERENDE UND ÄRZTE. Edited by Hofrat Prof. Dr. J. Hochenegg, Vorstand der II. chirurgischen Klinik in Wien; und Geh. Med.-Rat Prof. Dr. E. Payr, Direktor der chirurgischen Universitäts Klinik in Leipzig. Vol. I, Halves 1 and 2. 8vo. Price, 36 mk. Pp. 1244, with 527 illus. Berlin: Urban & Schwarzenberg, 1927.

The first volume of the second edition of Hochenegg and Payr's textbook of special surgery differs but little from the earlier edition. Because of the death of a number of the former collaborators several of the chapters have had to be rewritten. But, as a whole, the original plan of presenting, for the purpose of students, only well-accepted information has been adhered to. All controversial matter has been excluded.

The present volume, because of its bulk, is divided into two parts. The first part deals with the special surgery of the head and neck. The second part is concerned with the discussion of the surgery of the thorax and its contents, the spinal column and cord and the pelvis. At the beginning of each chapter, there are introductory remarks on the anatomy, the physiology and the pathology of the organs under consideration. The various surgical entities are described in brief but interesting manner. The illustrations are relatively few but are well chosen and reproduced. Probably because of the fact that the work is intended primarily as a textbook for students, bibliographical references have been entirely omitted.

A TEXTBOOK OF EMBRYOLOGY. By Harvey Ernest Jordan, A.M., PH.D., Professor of Histology and Embryology, University of Virginia; and James Ernest Kindred, M.A., PH.D., Associate Professor of Histology and Embryology, University of Virginia. 8vo. Pp. 614; 471 illustrations and 33 plates. N. Y.: D. Appleton and Co., 1926.

An appreciation of embryology is essential for the interpretation of many medical and surgical conditions. Reference volumes frequently confuse those lacking an adequate grasp of the elementary facts. It is for this reason that Jordan and Kindred's book will be of service, even though it is intended as a textbook for medical students. Representing the outgrowth of practical courses, the fundamental embryological data are presented that are essential for an appreciation of human development. Anatomical differentiations in

development are stressed although functional interpretation is adduced where requisite to clarify the principles of structure.

There is naturally some irregularity in the emphasis placed upon topics, but taken as a whole the volume constitutes an acceptable, useful textbook. Particularly commendable is the variety, profusion, and usefulness of the illustrations which are clear and in all instances serve to clarify the text. The book's value for teachers is enhanced by the inclusion of a chapter on Laboratory Exercises, with an abundance of drawings to assist students in interpreting the results of their laboratory studies.

A Bipolar Theory of Living Processes. By George W. Crile. 8vo. Cloth. Price, $5. Pp. 387; illus. N. Y.: Macmillan Co., 1926.

Most theories are advanced by their authors to explain all the known facts in their particular category. Crile undertook what might be called, in the vernacular, "some job" when he tackled an explanation of life. His bipolar "electric battery" theory of animal function, interesting and suggestive though it be, falls far short of acceptability.

In spite of all the calculus and determinations to the fifth decimal he naïvely remarks that "final proof is lacking in practically every point."

Has Crile allowed his fancy to meander into the limbo of the unknown as a relaxation from the very strenuous and practical work of a surgeon, or, as Jennings surmises, has he deliberately placed his clever tongue in his cheek and written this book as a parody on much of the research that encumbers medical literature? In either case it is an interesting revelation of his fine imagination. It deserves consideration for the collecting and marshalling of hosts of facts, and also because, right or wrong, Crile is here, as always, a stimulator of medical thought, an inspirer into the realms of research, a physician-philosopher.

Rational Gland Therapy for Women. Particularly in Relation to Menstruation. By I. Wanless Dickson, M.B., F.R.C.S., etc. 12mo. Cloth. Price, $2.00. Pp. 96. N. Y.: Paul B. Hoeber, Inc., 1926.

This little book is based on the clinical observations of the author with occasional references to the literature prior to 1917. It has the shortcomings of so much purely clinical literature in that the observations are recorded and inferences are drawn without adequate critique.

The absence of any reference to the recent brilliant work of Robert Frank, of Evans, and of Stockard is difficult to explain and calls for an early revision.

Handbuch der Biologischen Arbeitsmethoden. By Geh. Med.-Rat Prof. Dr. Emil Abderhalden, Direktor des Physiologischen Instituts der Universität Halle a. d. Saale. Section IV, Angewandte Chemische und Physikalische Methoden, Part VI, 2nd Half, No. 1. 8vo. Price, 6.60 mk. Pp. 140, with 8 illus. Berlin: Urban & Schwarzenberg, 1926.

This is a valuable and timely addition to Abderhalden's monumental text. The present great interest in liver function will insure frequent reference to its pages, wherever physiological and experimental problems are being investigated.

Its deals with test injections of the portal vein and with other chemical tests of liver function, the execution of Eck fistulae, liver extirpation in geese and dogs, Pavloff fistulae and the comparative study of digestion, all by distinguished authorities.

Modern Clinical Syphilology. Diagnosis; Treatment; Case Studies. By John H. Stokes, M.D., Professor of Dermatology and Syphilology in the School of Medicine, University of Pennsylvania; Professor in the Graduate School of Medicine, University of Pennsylvania; etc. With the Cooperation of Paul A. O'Leary, M.D., and William H. Goeckermann, M.D., Section on Dermatology and Syphilology, The Mayo Clinic; and Loren W. Shaffer, M.D., and Cleveland J. White, M.D., Department of Dermatology and Syphilology, School of Medicine, University of Pennsylvania. 8vo. Cloth. Price, $12.00. Pp. 1144 with 865 illus. Phila.: W. B. Saunders Co., 1926.

This textbook is an achievement of which American Medicine may be proud. Probably more great textbooks have been written on syphilis than on any other one disease, but they were written before the discovery of the Spirochaeta pallida, the introduction of salvarsan, the experimental study of the disease in animals, and of our present understanding

of the invasion and sojourn of the syphilis organism in man.

In this work, which discards nothing from our clinical heritage, the laboratory's contribution is given intensive and judicial description. The style is fascinating and the large number of original illustrations capture attention and point the lessons in the text. Just as no practice escapes contact with syphilis, so no physician or surgeon can afford to be unfamiliar with the facts and opinions nowhere so fascinatingly and authoritatively stated as in this splendid textbook.

Principles and Practice of Chemotherapy. With Special Reference to the Specific and General Treatment of Syphilis. By John A. Kolmer, M.D., D.P.H., D.Sc. (Hon.); Professor of Pathology and Bacteriology in the Graduate School of Medicine of the University of Pennsylvania, and Member of the Research Institute for Cutaneous Medicine. 8vo. Cloth. Price, $12.00. Pp. 1106, illus. Phila.: W. B. Saunders Co., 1926.

Wherever syphilis is seriously studied this volume will be needed for reference and as a spur to further contributions to a subject which, though still in its infancy, has made Brobdingnagian strides. Professor Kolmer's book is a monument to his industry and fills a need in English medical literature.

In the strictest sense all drug therapy is chemotherapy. Kolmer chooses the sterilization of the blood stream as his field. The several parts treat of the Principles of Chemotherapy, Chemotherapy of Bacterial and Mycotic Diseases, Chemotherapy of Trypanosomal Diseases, of Spirochetal Diseases other than Syphilis, of Protozoan and Metazoan Diseases other that Trypanosomal and Spirochetal Diseases, of Diseases of Doubtful or Unknown Etiology, Infection, Immunity, and Pathology of Syphilis in Relation to Treatment, etc.

The Normal Child and How to Keep It Normal in Mind and Morals. Suggestions for Parents, Teachers and Physicians; With a Consideration of the Influence of Psychoanalysis. By B. Sachs, M.D. 16mo. Price, $1.50. Pp. 111. N. Y.: Paul B. Hoeber, Inc., 1926.

With such an abundant evidence of saneness and counsel, it is regrettable that Sachs has written with such brevity. The chapter on The Evils of Psychoanalysis particularly merits reading at this time, when the master Freud is being betrayed by so many of his disciples.

Lehrbuch der Physiologie. By Emil Abderhalden, o.ö. Prof. und Direktor des physiologischen Instituts der Universität Halle a. S. Part III. Sinnesfunktionen. 8vo. Price, mk. 33. Pp. 650, with 304 illus. and 20 Colored Plates. Berlin: Urban & Schwarzenberg, 1926.

This is a series of lectures on the physiology of the special senses with splendid illustrations, suitable for students or practitioners. It is a splendid example of German scholarship and industry.

Hygieia or Disease and Evolution. By Burton Peter Thom, M.D. 12mo. Cloth. Price, $1.00. Pp. 107. N. Y.: E. P. Dutton & Co., 1926.

The Meaning of Disease. An Inquiry in the Field of Medical Philosophy. By William A. White, A.M., M.D. 12mo. Cloth. Price, $3.00. Pp. 220. Baltimore: Williams & Wilkins Co., 1926.

These two little books delightfully marshal facts in support of philosophical theses.

Hygieia's accomplishments and promises are recounted by Thom for laymen though physicians may well spend with her a pleasant hour.

White's volume is more profound. He emphasizes the importance of the psyche in all disease states and concludes that "disease is regressive; disease is an attempt at energy equilibrium."

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences, Edited by Hobart Amory Hare, M.D., LL.D., Professor of Therapeutics, Materia Medica and Diagnosis in the Jefferson Medical College, Philadelphia, etc., assisted by Leighton F. Appleman, M.D., Instructor in Therapeutics, Jefferson Medical College, Philadelphia, etc. Vol. iii. Sept., 1926. Vol. iv, Dec., 1926. Phila.: Lea & Febiger, 1926.

These volumes maintain the tradition of a useful digest of medical literature. The reviews are complete and well-balanced summaries of progress during the preceding year.

PROGRESS IN SURGERY

Selections from Recent Literature

REICHERT, FREDERICK LEET. The regeneration of the lymphatics. *Arch. Surg.*, Dec., 1926, xiii.

Regeneration of lymphatics has been demonstrated under conditions closely approximating the normal. The results are based on injection experiments in replanted limbs of dogs. New lymphatics are shown to cross a scar as early as the fourth day and by the eighth day the regeneration is physiologically adequate in both the deep and the superficial sets of lymphatics. Concurrent experiments have shown that compensatory arterial and venous regeneration occur by the third and fourth day, respectively. Stasis of the lymphaticovenous system provides a stimulus for the regeneration of both groups of lymphatics.

Proof is advanced that the lymphatics play an important rôle in assisting the veins in overcoming edema and restoring a limb to its normal condition. Study of the postoperative edema following replantation of the limb leads to a better understanding of such postoperative changes as edema and induration of the skin and subcutaneous tissues after dissections of the glands of the neck.

These studies on lymphatic regeneration offer reasons for surgical procedures in treating malignant conditions; namely, the primary growth should be removed before or at the same time as the regional glandular dissection. If, as is sometimes practiced, the clean operation of removal of glands is done a week or more before the primary growth is excised, sufficient time will have elapsed for the regeneration of new lymphatic channels.

HIRSCH, MAXIMILLIAN. Should thrombosis of varicose veins be undertaken without antecedent ligature of the saphenous vein? (*Ist die künstiche Thrombosierung varikös entarter Beinvenen ohne vonherige bohe Ligatur der Vena saphena zulässig?*) *Wien. klin. Wchnschr.*, Nov. 4, 1926.

The author calls attention to the possibility of sudden death as a result of embolus following thrombosing of varicose veins by means of chemical injections. He suggests therefore that in all such cases the internal saphenous vein be ligated high before undertaking injection of the veins. By this procedure the thrombus that is formed cannot be washed into the general circulation and, too, there is given more opportunity for the formation of a definite thrombosis of the diseased veins.

DAVIS, DAVID. The determination of the icterus index with capillary blood. *Am. J. M. Sc.*, Dec., 1926, clxxii, 848.

A new and very simple clinical method for the determination of the icterus index is presented; a few drops of blood are centrifuged in a 2-mm. tube and the serum is compared with standards.

Venipuncture is obviated by this method, which therefore is convenient for frequent determinations and is particularly suitable in children and infants. The test is accurate and reliable.

CRADDOCK, FRENCH H., and WHETSTONE, GERTRUDE. Diathermy in the treatment of shock. *South. M. J.*, Nov., 1926, xix, 812.

The authors report the case of a man admitted to a hospital in a condition of extreme traumatic shock. His pulse was imperceptible, he was in a cold clammy sweat and generally prostrated. He had fallen 80 feet from a railroad bridge, striking on hard ground, among rocks, and sustaining several fractures. Block tin electrodes were placed on each wrist, and about 500 ma. diathermy were given for thirty minutes. Soon the upper part of the body became warm, the cold clammy sweat ceased, and the radial pulse could be felt. The electrodes were then placed to each ankle and the process repeated, which gradually warmed the lower part of body. The temperature was raised from 96°F. to 99°F., and the patient began talking, regaining consciousness gradually. The reduction of fractures was possible about twelve hours later, and the patient made a good recovery.

Crile has reported the prevention of shock in operative cases with the diathermy machine, by passing the current through the liver. In shock there is an extreme loss of heat, and the diathermy machine is the best method the authors have found for generating internal heat. All methods of supplying heat externally have proved slow and unsatisfactory.

PLATOU, E. S., and RIGLER, LEO. Roentgen-ray therapy in erysipelas. *Arch. Int. Med.*, Nov. 15, 1926, xxxviii, 573.

The present methods of treatment of erysipelas are distinctly unsatisfactory and accomplish little.

Roentgen-ray therapy applied to the affected part produces a rapid improvement in both the local and the systemic manifestations, with a reduction of temperature to normal in from one to two days.

In a group of cases treated by the routine methods and a similar group treated by roentgen-ray irradiation, vastly superior results in the irradiated group were shown.

Treatment with the roentgen ray is an effective method for shortening the course and decreasing the morbidity and mortality in erysipelas.

LEWALD, LEON T. "Cyclic vomiting" in infants and children. Including an analysis of the occurrence of vomiting in two hundred children examined roentgenologically. *Radiol.*, Nov., 1926, vii, 410.

1. In a series of about two hundred infants and children referred for roentgen examination on account of chronic disorders of the digestive tract, a history of recurrent or cyclic vomiting was obtainable in at least one-third of the cases.

2. The cases were nearly equally divided as to sex.

3. A previous diagnosis of acidosis had been made in at least 20 per cent.

4. The predominant roentgen findings related to the colon, particularly redundancy.

5. Pylorospasm, dilatation of the stomach, and ptosis of the stomach were frequent additional findings.

6. Roentgen evidence of chronic appendicitis sufficient to warrant operation was encountered in only a very few instances. The appendix should never be removed for supposed chronic appendicitis without a thorough roentgen examination of the digestive tract in order to exclude other abnormalities, or to obtain confirmatory evidence of chronic appendicitis and to find the exact location of the appendix. Forty-eight cases of left-sided appendix have been found on roentgen examination by the author, associated with either complete transposition of the viscera or non-rotation of the colon.

7. In two cases the appendix had been removed previously *without* relief.

8. In one case in which the gastrointestina tract was negative, operation for correction of internal strabismus cured the vomiting attacks.

9. Cyclic vomiting is not an entity, and has no specific cause.

10. It is probably of reflex nature and usually is associated with abnormalities in some portion of the digestive tract.

SICARD, J. A., and FORESTIER, JACQUES E. Roentgenological exploration of spinal and cerebral spaces, genito-urinary organs and other organic cavities with iodized oil. *Radiol.*, Nov., 1926, vii, 385.

Lipiodol is a safe means of contrast for radiodiagnosis. Beside the principal roentgenological uses of lipiodol (bronchial tubes, and cavities of the spine), there exist several of minor importance but of interest. Uterus and fallopian tubes, cold abscesses, the male urethra, vas deferens and seminal vesicles, facial sinuses, lachrymal ducts, biliary fistulae and limb arteries have been thus explored and valuable results in diagnostic respects have been obtained.

Lipiodol has proved quite useful for experimental purposes, especially for the visualization of the blood stream and the exploration of the permeability of the capillary networks in animals.

STEVENSON, WALTER C. The rationale and technique of combining operation with radium treatment in cancer. *Lancet*, Dec. 4, 1926, ccxi.

Stevenson states that when operation and radiation are combined in the treatment of cancer: 1. There is no advantage in giving a lethal cancer dose of radiation first and delaying operation more than a week, as further delay increases the difficulty of the operation and the shock. 2. Over-radiation of a cancerous mass which cannot be completely removed, followed immediately by its partial removal, lessens the shock and the operative difficulties. 3. At the operation it is an advantage to bury radium tubes and needles in the incised area and in the paths of dissemination. 4. It is an advantage to radiate the whole operation and suspicious area about three weeks after operation when the incisions have soundly healed. 5. The patient's general condition is the best guide to the extent of the operation and the intervals of time at which different areas are to be efficiently radiated.

Brickner, Walter M., and Milch, Henry. Surgical clinics from the Broad Street Hospital, New York. *Internat. Clin.*, Dec., 1926, S. 36, iv.

1. *Gas Gangrene Infections.* Discussing the pathology, bacteriology and clinical manifestations of gas gangrene, the authors report 4 cases in civil practice, all fatal in spite of active treatment. They deplore the fact that there is not available in this country a polyvalent antitoxin such as has been developed and successfully used by the French.

2. *Carcinoma of Terminal Ileum Causing "Sciatica."* This case is of interest because of the unusual location of the carcinoma and because by pressure in the pelvis it produced symptoms that had been for a long time treated as sciatica.

3. *Spinal Cord Injuries.* Reporting 3 cases of spinal cord injuries, the authors call attention, among other things, to the fact that a permanent paraplegia may result from an injury to the cord in which, at operation, however early, no gross change in appearance or texture can be discovered, and no blood is found within the dura.

Parham, F. W. Head injuries marked by intracranial tension. *New Orleans M. & S. J.*, Dec., 1926, lxxix.

Parham concludes:

1. No operation should be done in the state of shock. One of the measures calculated to help shock is the intravenous use of strong solutions of glucose.

2. Until shock is subdued, the time may be profitably spent in getting the history from witnesses and taking pulse, respiration, blood-pressure and temperature at intervals.

3. When the shock is relieved then a spinal puncture is made to get the intracranial pressure, always in a horizontal position and after waiting a sufficient time for adjustment before reading the manometer. The manometer is essential.

4. If the reading is moderately high the fluid is allowed to flow until the reading shows normal pressure. This is to be repeated at intervals of twenty-four hours or less in urgent cases.

5. If the reading shows very high pressure, enough fluid is withdrawn to bring the pressure to about one-half at the first puncture.

6. If the case is urgent the lumbar puncture may be aided and protected by an intravenous injection of a 25 to 40 per cent solution of glucose. Danger of medullary jamming is thereby lessened.

7. If at the second puncture the response is satisfactory, the case should continue to be treated by lumbar puncture in conjunction with magnesium sulphate by rectum, preferably, or by stomach ingestion through a duodenal tube.

8. Should these measures fail to relieve the cerebral tension then subtemporal decompression should be done.

9. Subtemporal decompression should always be assisted by drainage unless there is infection. It seems not logical to do a decompression without draining (for not longer than forty-eight hours) the subtemporal space. Sachs drains in no instance, as he considers it dangerous.

10. In epidural hemorrhage the dura should also be opened if there are other signs of intracranial tension, unless the wound is septic.

11. Cushing, Putnam and many others have shown the bad effects of leaving a subdural hemorrhage which cannot be drained by lumbar puncture.

12. In bad cases of tension it may be advisable to puncture the ventricle on the side of the decompression.

13. It must be remembered that a saline or glucose intravenous injection will sometimes revive a man already showing Cheyne-Stokes respiration.

14. There is no reason why spinal puncture should not be done in any case where it is indicated. If it be done slowly, watching the pulse and respiration, it may easily be discontinued before trouble comes.

15. Should there be signs of danger after withdrawal of fluid, the danger may be overcome by an intravenous injection of 30 to 50 c.c. of a 25 per cent solution of salt or glucose, which should always be at hand for such emergency.

Patton, E. W. Abnormally attached frenum labium with surgical interference. *Internat. J. Orthodontia, Oral Surg. & Radiog.*, Nov., 1926, xii, 1085.

Spacing seen between upper central incisors and sometimes, though seldom, between lower incisors is often caused by the overdeveloped and abnormally attached frenum labium.

When the frenum is abnormal as to size and attachment its fibers pass through between the

incisors, attaching ofttimes in a deep fissure formed by the maxillary bones, and ending in a tuft of tissue lingual to the gingival border of the gums. Upon raising the upper lip the frenum will be seen to spread out in fan-shape, losing the ends of its fibers in the lip.

Under gentle stimulation the space between the incisors is to be partially closed. When two-thirds closed, the frenum should be removed surgically. This operation is performed by anesthetizing the tissues, and with sharp bistoury, cutting down to the bone on each distal margin of the frenum and around the tuft of tissue on the lingual surface, thus enucleating the stricture. Then with sharp small currette the whole is peeled out from lingual to labial and from deep down in the fissure. With sharp knife or scissors it is then cut off about 5 mm. above the gingival border. A few sutures may be inserted, but rarely is this necessary. Teeth should now be moved into contact with each other, and retained there until fibers from each adjoining wall have united, and tissues have become fixed in their new environment.

Jesberg, Simon. A method of removing a bead from a bronchus. *Laryngoscope*, Dec., 1926, xxxvi.

Smooth, round or oval foreign bodies in a bronchus tend to descend as far as possible, dilating the air tubes and permitting a partial collapse of the lumen above the body. Such a body, if hard and smooth, is almost impossible to engage with any usual grasping instrument, and if impacted there is insufficient room between it and the walls of the bronchus to permit the passing of an instrument around it. Even the slightest pressure pushes the foreign body deeper and impacts it more tightly.

In the case of a foreign body containing a hole, e. g., a bead, the sides of the hole can be used as a grasping surface. If, however, the hole is small, it is difficult to pass into it a probe or grasping forceps sufficiently strong to be safe.

The device here described consists of a steel stylet or probe, the distal end of which contains an eye through which a thin rubber band can be threaded. The probe with the stretched rubber band is made just small enough to pass through the hole in the bead. When this is accomplished the tension on the rubber band is released and the expansion of the rubber band locks the bead on the stylet.

Chapman, T. L. Local anesthesia in toxic goiter. *Minnesota Med.*, Dec., 1926, ix.

Chapman makes use of infiltration only, proceeding carefully and quickly through the front planes until the surface of the gland is exposed, then infiltrating the loose connective tissue at the side and behind the lobes, seizing and raising them so that any necessary advancement of the edematized field can be easily made without pain. This can be done with a short needle without the slightest danger of injury to important adjacent structures. In his whole series no such injury has occurred, and anesthesia was entirely satisfactory. The solution used is 0.5 per cent procaine, in normal salt solution.

In two years, more than three hundred goiters, mostly of the exophthalmic type, were operated upon by this method, with no reason to feel that it failed in any instance in satisfactory anesthetic effect or in giving the greatest possible lack in undesirable after-effect to the patients.

With regard to time consumed in getting to the actual removal of the gland at operation, it is quite as rapid as with other methods, and there is the additional advantage that the infiltration edema produced makes for easy separation of anatomical planes with the greatest precision and minimum of bleeding.

In the severe and questionable cases local anesthesia will show frequently so decisive a gain over any other type of anesthesia that a distinct advantage over all other methods may be read in the mortality and morbidity records. By this mode of management, some extreme cases can be brought to surgery that by any other method are impossible and not to be considered.

On the surgeon's side can be credited these values: The anatomical relationships with local anesthesia are accurate and undisturbed, the edematization of the tissues making their dissection and separation quick and easy; the engorgement of the veins, so notable in nitrous oxide and ethylene anesthesia, is not seen. The control of blood loss is very accurate, and the advantage of a shortened operating time is thus secured. If doubt regarding hemostasis is felt, the patient can be called upon to cough or hold the breath, before closure of the deep field, to test the accuracy of the ligations. Test of phonation can be voluntarily employed by the patient during the operative maneuvers, if

it is believed that a recurrent laryngeal nerve may be in danger of injury.

Sistrunk, W. E. The management of patients with goiter. *Minnesota Med.*, Dec., 1926, ix.

Clinically, practically all goiters may be classified under three types: colloid, adenomatous and exophthalmic. Combinations of these also occur. Colloid goiter is a goiter of youth, not associated with hyperthyroidism, and often responds to treatment by medicine. Adenomatous goiter also usually begins in youth. In younger people it is not found associated with hyperthyroidism. It produces a nodular, irregularly shaped goiter and over 20 per cent of the patients later develop a hyperthyroidism that differs from that seen in exophthalmic goiter. This type of goiter does not respond to treatment by medicines and should be looked upon as surgical. The most advantageous time for removal of such goiters is between the ages of twenty-five and thirty. Exophthalmic goiter may occur at any age. It is always associated with hyperthyroidism. It responds best to treatment by operation and the earlier the operation the better the end-result. Iodine used as a means of preparing patients with exophthalmic goiter for operation diminishes very greatly the chances of dangerous postoperative hyperthyroidism.

Higgins, C. C. Tuberculosis of the thyroid gland, with a report of five cases. *Internat. Clin.*, Dec., 1926, S. 36, iv.

Five cases are reported of tuberculosis of the thyroid gland from the service of Dr. G. W. Crile; these, in addition to nine cases reported in 1917, making a total of fourteen cases in his series.

Tuberculosis of the thyroid gland is rare.

In ten of the fourteen cases the gland showed increased activity.

Because in many cases of tuberculosis of the thyroid gland pulmonary tuberculosis is present, regional anesthesia should be used in all such cases, and a general hygienic regimen should be instituted to improve the patient's resistance and to further the healing of the pulmonary lesion.

McFarland, Joseph. Ninety tumors of the parotid region; in all of which the postoperative history was traced. *Am. J. M. Sc.*, Dec., 1926, clxxii, 804.

From this study McFarland concludes:

1. The theory of "enclavement" or accidental sequestration of embryonal cells during the early and complicated development of the face and neck affords the most satisfactory explanation of the origin of their mixed tumors.

2. By that theory it is easy to account for the number and variety of tissues found in the tumors, and for their varying proportions and conditions.

3. Mixed tumors are individual entities, having no relation to the normal structures in which they occur, but from which they do not arise.

4. They have nothing to do with other kinds of tumors, and should be called "mixed tumors" and nothing else, regardless of their histology.

5. They are inherently benign, but commonly recur after excision, and if frequently disturbed become locally destructive and invasive, without metastasizing.

6. The histology of mixed tumors is extremely complex, but on that account their microscopical diagnosis is usually very easy.

7. The immaturity, atypical arrangement and confused intermingling of the various tissue components easily lead to misinterpretations as to their nature and mistakes as to their dispositions.

8. Histological variations among mixed tumors have no bearing upon prognosis. The microscope, beyond showing that the lesion is a mixed tumor, is misleading rather than enlightening.

9. The rapid enlargement of a mixed tumor of long duration and slow growth is not the result of malignant change.

10. Malignant change, whether "sarcomatous" or "carcinomatous," in mixed tumors must be rare, and its occurrence is difficult to prove.

11. As intervals of ten, twenty and even thirty years may elapse between the operative removal of a mixed tumor and its recurrence, caution should be exercised in declaring any case cured.

Bársony, Theodor. Functional esophageal diverticula. (*Funktionelle Speiseröbren-Divertikel.*) *Wien. klin. Wchnschr.*, Nov. 18, 1926.

Bársony reports 2 cases of duodenal ulcer in which so-called "functional relaxation diverticula" were found. This type is found only

during the act of swallowing. The author calls attention to the fact that as a result of some organic disease in other parts of the gastro-intestinal tract, there may arise segmental increase as well as decrease in the tonicity of the esophageal musculature. Where an area of segmental decrease in tonicity is found between two areas of segmental increase of tonicity, a relaxation, transitory diverticula may result. The author believes that this type may in time result in the formation of a true pulsion diverticulum.

Heindl, Adalbert. Early treatment of erosion of the esophagus. (*Frühbehandlung der Speiseröhrenverätzungen.*) *Wien. klin. Wchnschr.*, Oct. 28, 1926.

The author calls attention to the frequency with which chemical burns of the esophagus occur in his country because of the taking of caustic potash with suicidal intent. He reports on 18 adult cases seen since 1920. In all of these cases early passing of a bougie in the esophagus was undertaken with the idea of preventing stricture formation. The bougie can usually not be used before the expiration of two to three days after the swallowing of the chemical. Even at this time, the pain incident upon the passage of the instrument may be so intense as to require an opiate. In the opinion of the author this procedure leads not only to a decrease in the number of strictures but also brings about an earlier and more complete restoration of function in those cases that do not go on to stricture formation.

Greenough, Robert B. Carcinoma of the breast. *Am. J. Roentgenol. & Rad. Therap.*, Nov., 1926, xvi, 439.

From a small series of cases, Greenough believes that the following conclusions are justified:

(1) Radical operation performed before the disease has extended widely offers the best expectation of cures for cancer of the breast.

(2) Pre-operative and postoperative irradiation with roentgen rays, as given at the Massachusetts General Hospital in 1918–1920, does not appear to have been of value as an adjunct to surgical operation.

(3) Nearly 30 per cent of all cases of cancer of the breast are of so malignant a character that with our present resources we are unable to cure the disease.

(4) The remaining 70 per cent of cases give reasonable hope of cure by operation when the disease is not too far advanced.

(5) Education of the public and of the medical profession as well, to a better appreciation of the possible significance of all breast tumors, and to a more prompt application of treatment, may yet notably diminish the mortality of this disease.

(6) In the treatment of breast cancer, which is beyond hope of cure by operation, roentgen irradiation offers prospect of relief which can be obtained at present by no other means.

Rawls, Julian L. The treatment of general peritonitis and allied conditions. *Virginia M. Monthly*, Dec., 1926, liii.

The plan of treatment recommended consists in withholding all fluids by mouth until the abdominal symptoms have subsided, this sometimes taking from a week to ten days; and giving subcutaneously, daily, from 1000 to 3000 c.c. of normal saline solution to which have been added 0.33 gms. of novocaine per 1000 c.c. to relieve pain. In the intestinal obstruction cases, where there is an increase in the urea content of the blood and a decrease in blood chlorides, the strength of the saline solution is frequently doubled, and with the novocaine this does not produce undue pain. Use frequent gastric lavage if there is any tendency to the accumulation of fluid in the stomach. Do not wait for the patient to vomit in these cases; if there is any suspicion of a retention of fluid in the stomach, anticipate the vomiting by the introduction of the tube. Frequently one obtains more than 1000 c.c. of offensive, yellowish material when the patient has not vomited at all. Lavage is a life-saver. If the vomiting is persistent or would require the frequent passing of a stomach tube, a duodenal tube is introduced into the stomach and fastened to the cheek with adhesive plaster. This drains into a basin and the stomach is washed out at frequent intervals through this tube with a soda bicarbonate solution. Give each day not less than 10 gms. of glucose intravenously. Rawls uses ampules of 10 gm. in 20 c.c. of water. The contents of the ampule are sucked up cold in a warm 20 c.c. syringe and the fluid without dilution is injected directly into the vein. He has had no trouble with it in any way.

The surgical condition in the abdomen, of course, is treated by the usual surgical means: that is the repair of perforations, the releasing

of obstruction, enterostomy when indicated, and the establishment of drainage. No case has been treated expectantly, although cases have been tided over a day or two under treatment until they became better risks. Rawls makes no attempt to flush out the abdomen. He has used suction to remove accumulations of fluid but no substance has been introduced into the abdominal cavity.

Butler, Dell D. Post-operative gas bacillus infection of the abdominal wall. *Ann. Surg.*, Dec., 1926, lxxxiv.

Butler records 2 cases and some of the literature. He concludes:

1. Postoperative gas bacillus infection of the abdominal wall is a very rare complication, but serious.

2. There is relatively little risk as gas producing anaerobes were not found in any cultures made.

3. Suspicion of such a complication should be aroused by a sudden increase in pulse rate, with or without a rise in temperature, in a patient who is not doing well after operation.

4. The diagnostic signs are copper-colored bronzing of the skin, with edema, brownish, foul-smelling discharge from the wound, crepitation, and positive bacteriological smears.

5. Treatment should be prompt multiple incisions and free drainage.

6. The prognosis depends upon the extent of the infection.

Newburger, Bernhard. Metastatic intramuscular gonococcal abscess. *Ann. Surg.*, Dec., 1926, lxxxiv.

Seven cases of probable but unproven gonococcic abscesses in muscle tissue are abstracted from the literature and a case due to a transient gonococcemia is presented with confirmatory bacteriological data.

Sénèque, J. Therapeutic indications in fistulae of the pancreas. (*Les indications thérapeutics dans les fistules pancréatiques.*) *Presse Méd.*, Nov. 27, 1926.

Pancreatic fistulae may arise as a result of contusions of the abdomen, as a result of surgical traumata in the course of other operations or as one of the sequelae of an antecedent acute pancreatitis. In general, a long interval of time, about nine months, should elapse between the appearance of the fistula and the institution of surgical measures. During this period, conservative measures should be employed, such as the use of bicarbonate of soda, atropine and a rigid adherence to an antidiabetic diet. In those cases in which there is very little pancreatic juice excreted cauterization of the tract may help in closing the fistula. In other cases in which true pancreatic juice is excreted, the skin should be protected against autodigestion by vaselined gauze and the pancreatic fluid should be carefully siphoned and fed to the patient to prevent emaciation. Where the patient is rapidly losing ground as a result of the loss of a large amount of pancreatic fluid operation should be undertaken. The only operation offering hope of success is that in which the pancreatic fistula is dissected free and reimplanted into the stomach, the gall bladder or the small intestine.

Einhorn, Max. Pancreatic tumors, malignant and benign. *Am. J. M. Sc.*, Dec., 1926, clxxii, 796.

Einhorn quotes Malley-Guy and reports 9 cases. In most of the patients the principal symptoms were loss of appetite (in some disgust for food) and more or less constant distress in the epigastric region with frequent eructations. Severe attacks of pain, especially in the left hypochondrium, radiating to the dorsal vertebra were met with. In a few patients the pain was more pronounced in recumbency, while relief was obtained in standing, sitting or lying on the right side.

In the malignant cases there is a gradual progression of the disease without any marked periods of intermission.

In the benign variety of chronic pancreatitis there are periods of suffering alternating with more or less prolonged intervals of euphoria.

The pancreatic juice almost always reveals a diminished activity and sometimes a complete lack of some of the ferments (this refers to a greater extent to the malignant conditions of the pancreas, especially when the malady is already advanced). The bile is usually turbid, containing cholesterin crystals and often pus corpuscles. The gastric contents frequently show achylia or a high degree of subacidity in the malignant cases and hyperchlorhydria or euchlorhydria in the benign.

Jaundice is encountered in a number of these cases, principally when the head of the pancreas is especially involved. The diagnosis is then somewhat facilitated. In all the cases there was a chronic cholecystitis.

Surgical intervention is frequently practiced. Exploration sometimes helps to make a differential diagnosis.

Two cases of pancreatic tumors (due to simple inflammation) causing jaundice, with perfect recovery, one after simple biliary drainage and the other after cholecystogastrostomy, deserve special mention. In both the condition simulated malignant disease of the gall bladder or pancreas. If no operation had been done they would certainly have succumbed after great suffering.

MATEER, JOHN G., and HENDERSON, W. STUART. Chronic biliary tract disease. *Arch. Int. Med.*, Dec. 15, 1926, xxxviii.

This study is mainly based on a detailed analysis of the diagnostic findings in ninety-four consecutive operated patients with chronic gall tract disease.

Recent pathological studies indicate that chronic gall tract disease involves not only a chronic cholecystitis but also a chronic interstitial hepatitis and a chronic cholangitis with dilatation of the larger extrahepatic bile ducts. The relative involvement of the gall bladder, bile ducts and liver varies greatly in the individual case, making it desirable to use various methods of diagnosis to obtain information regarding the involvement of these three parts of the biliary tree.

The history affords most valuable evidence for the presence of gall tract disease. It is indispensable to a correct functional diagnosis and a proper evaluation of the gastrointestinal symptoms. This is especially important in patients who have evidence of several pathological conditions in the gastrointestinal tract.

The physical examination aids greatly in the differential diagnosis from irritable colon, chronic appendicitis, renal disease, etc.

Cholecystography affords reliable information in a high percentage of cases, and has greatly refined gall-bladder diagnosis. The oral administration of the dye is unobjectionable, and also reliable, if a proper and uniform technique is followed. Other roentgen-ray methods are still of value in a smaller percentage of cases, and should be used in conjunction with cholecystography.

Duodenobiliary drainage affords important direct evidence of chronic cholangitis, and valuable indirect evidence of cholecystitis, in the finding of bile-stained clumps of pus cells and bile-stained colonies of bacteria, frequently in association with bile-duct epithelium. Showers of clumped crystals in the bile strongly suggest gallstones.

By utilizing biliary drainage to determine the earliest stages of bile duct infection and inflammation, cholecystography to ascertain the pathologic physiology and anatomy of the gall bladder, and a serum bilirubin determination to gain some idea relative to the liver involvement, the diagnosis of early gall tract disease, suspected on the basis of clinical symptoms, can be confirmed and refined.

WANGENSTEEN, OWEN H. Should the gall-bladder be removed without drainage? *Ann. Surg.*, Dec., 1926, lxxxiv.

Wangensteen reports a case and experiences of others, and concludes that the so-called "ideal cholecystectomy" is not a safe procedure. An instance of its practice in which drainage was omitted is cited, the outcome of which was favorable following the spontaneous escape of a large quantity of bile through the abdominal incision. Numerous instances are reported where relaparotomy was necessary because of bile leakage when drainage was omitted. A still greater number died because of the escape of bile and the failure to drain. The leakage of bile may be early or delayed. That occurring soon after removal of the gall bladder is due to injury to the liver bed or severance of small aberrant bile ducts. The delayed escape of bile is occasioned by insufficiency of cystic duct occlusion. Drainage after cholecystectomy is imperative. It is a safeguard and does no harm.

DELORE, X., MALLET-GUY, P., and BURLET, J. Late results after gastric resection for carcinoma. (*Suites éloignées de la résection gastrique pour cancer.*) *Presse Méd.*, Oct. 6, 1926.

Of 130 cases operated upon for gastric carcinoma, 88 were carefully followed. The authors have considered those alive after three years as definitely cured. They obtained only 16 per cent of such cures. Practically all of the cases showed a period of temporary cure lasting on an average about eighteen months. Thereafter the patients usually began to complain of various gastric troubles, icterus, ascites and pain, which were considered as signs of recurrence. The authors show that the occurrence of a pyloric stenosis is to be considered a favorable early sign rather than as of bad prognostic

significance and that the apparent involvement of lymph nodes bears no relation to the time or the likelihood of recurrence. The demonstration of the presence of a colloid carcinoma, as against any other type of cancer, decreases the outlook for ultimate cure by almost half.

Palmer, Walter Lincoln. The mechanism of pain in gastric and in duodenal ulcer. *Arch. Int. Med.*, Dec. 15, 1926, xxxviii.

Palmer finds that:

1. Typical ulcer distress can be initiated in ulcer patients under suitable conditions by: (*a*) the reinjection of the gruel obtained at the time of distress, (*b*) solutions of hydrochloric acid of similar concentrations (and therefore entirely physiological) or by stronger solutions, (*c*) solutions of sulphuric and acetic acids and of sodium hydroxide.

2. Such distress is not produced in normal stomachs by similar injections.

3. Distress so produced is relieved by neutralization of the chemical irritant, or by partial removal of the irritant and neutralization of the remainder.

4. Hydrochloric acid is the irritant normally present in the gastric content which constitutes an adequate stimulus to the pain-producing mechanism of a sensitive peptic ulcer.

5. The distress of gastric carcinoma can be similarly induced at times.

6. The distress typical of the other abdominal conditions studied has not been induced by acid injections up to the present time, or, if already present, it has not been altered by them.

7. No evidence has been obtained of hyperesthesia of the gastric mucous membrane, or of pain as the result of hyperchlorhydria with an intact gastric and duodenal mucosa.

Chenut, A. Experiments in mechanical intestinal obstruction of the jejeunum and ileum. (*L'expérimentation dans l'occlusion méchanique du jejuno-iléon.*) *Rev. de chir.*, 1926, xlv, No. 7, 474.

The author has performed a great number of experiments on dogs for the purpose of studying mechanical occlusion of the small intestine. In brief, he comes to the conclusion that the prime factor in determining the survival or death of the patient suffering with intestinal occlusion is the viability of the intestine. Any intereference with this predisposes to the development of peritonitis. Early operation is advised. The author calls attention, however, to the fact that "early" is a relative term. What may appear early in one case might be entirely too late in another apparently similar case. A number of different criteria have been described for determining the state of the gut but all appear to be difficult of application in a routine manner. In general, the attitude to be adopted is wide resection of the involved loop of gut when the condition of the patient warrants and otherwise exteriorization of the loop until such time as the condition permits further operative procedures.

Colp, Ralph. External fecal fistulae in acute appendicitis. *Ann. Surg.*, Dec., 1926, lxxxiv.

In 2841 consecutive cases of acute appendicitis 1.1 per cent developed fecal fistulae. These are most frequently seen in cases of acute gangrenous appendicitis and abscess. Rough surgical manipulation and improper drainage materials contribute to their formation. The incidence of appendiceal fecal fistulae appears less with the "simple drop" method than with the inversion of the appendix stump.

When fecal fistulae are once established drainage tubes should be shortened or removed if feasible, or ones of smaller caliber should be substituted. The great majority of fecal fistulae of appendiceal origin will heal spontaneously if treated conservatively. In this series only 12 per cent were subjected to surgical interference.

Bendixen, P. A., and Lamb, F. H. Malignant tumors of the adrenal in children. With report of a case. *J. Lab. & Clin. Med.*, Nov., 1926, xii.

From their case study and the literature the authors conclude:

1. Suprarenal medullary malignancy is not an altogether unusual occurrence.

2. In the majority of cases an orbital hemorrhage is the first sign observed, and it may occur before any tumor is palpable.

3. The orbit first involved is often on the same side as the primary tumor.

4. Diagnosis should not be difficult once the orbital hemorrhage has occurred; the disease is likely to be mistaken only for trauma, chloroma and scurvy.

5. Surgical interference can be of no avail, except as a palliative to drain a pyonephrosis or to meet other complications, as the metas-

tases occur usually before a diagnosis can be made.

6. Metastases probably occur via the lymph stream.

7. The malignancy rarely metastasizes to the skin.

8. The medulla of the suprarenal gland being neuroectodermic in origin, these malignant tumors are similar in their histological structure to malignant neoplasms of the sympathetic nervous system, and they are correctly designated as neuroblastoma.

Burdick, Carl Goodwin, and Coley, Bradley L. Abnormal descent of the testicle. *Ann. Surg.*, Dec., 1926, lxxxiv.

In practically all cases of undescended testicle there is a patent funicular process in which a definite hernia is almost certain to develop in later years. Any testicle that does not lie in its normal position is more subject to trauma and more liable to malignant degeneration. Statistics show that the incidence of malignant changes is fifty times greater in the imperfectly descended testicle. Every growing boy is prone to an inferiority complex which may prey upon his mind if his testicles are not normally situated.

The chief value of the imperfectly descended testicle lies in its internal secretory function, and for this reason castration is not to be recommended and should never be performed in cases of double maldescent.

A thorough understanding of the fascial planes of the groin is essential to be sure that the testicle is placed in its proper position. In this series Burdick and Coley found 9 cases after operation in which examination revealed the testicle in the thigh rather than in the scrotum. Faulty direction of the gubernaculum is the usual cause of this error.

The activity of the cremasteric reflex should always be borne in mind in examining patients suspected of having an undescended testicle.

The ideal age for operative interference is between eight and twelve years. The presence of a large hernia is an indication at any age since a truss should never be worn.

Prognosis should be especially guarded in individuals of either the Froelich type of hypopituitary adiposity or the clinical type of hypogonadism.

In a series of 537 operations, satisfactory results as to the location of the testis were obtained in about 50 per cent. As regards the size of the testicle, satisfactory results were obtained in about 15 per cent. Except in rare instances an atrophic testicle when placed in the scrotum does not continue to develop normally.

Mekie, Eric C. Parasitic infection of the urinary tract. Report of a case of infection of the urinary tract by acari, together with an analysis of previously reported cases. *Edin. M. J.*, Dec., 1926, xxxiii.

Mekie reports an interesting case and discusses the literature of this rare type of urinary tract infection. If the urinary tract becomes infected by members of the arachnida species, the result is a clinical picture suggesting irritation of the tract, and one of the commonest symptoms is nocturnal enuresis. The urine frequently contains large sheets of epithelial cells. The presence of acari in the urine can be assumed to indicate true endoparasitism only in those cases in which they are found repeatedly and when precautions have been taken against contamination. A secondary micro-organismal infection of the urinary tract is liable to occur.

Helmholz, Henry F. Neuromuscular dysfunction of the bladder as a cause of chronic pyelitis in childhood. *Am. J. Dis. Child.*, Nov., 1926, xxxii.

Fifteen cases of neuromuscular dysfunction of the bladder in children, whose ages range from a few days to fourteen years, are reported. Ten of the cases are of the cord-bladder type, 4 of the atonic type, and in 1 there was complete relaxation of the bladder sphincter. The prognosis in such cases is poor and treatment is difficult. Spina bifida occulta was found in 6 cases, but it is difficult to evaluate its relationship. Treatment of the complicating infection, chronic pyelitis and cystitis by the usual methods is practically always unsuccessful. Development of surgical methods of relief offers the only hope.

Sahler, Josef. Dysmenorrhea and its treatment. (*Dysmenorrhoe und ihre Behandlung.*) *Wien. klin. Wchnschr.*, Nov. 25, 1926.

In his work at the gynecologic clinic of the University of Vienna Sahler has for many years been giving roentgenotherapy to women suffering with all manner of ovarian disturbance. The results have been especially good in those cases of headache associated with or occurring

shortly after the menopause. In the present communication, he reports on 72 cases of dysmenorrhea treated by exposing the pituitary body to the roentgen ray. The hair is protected by means of lead plates and the pituitary is rayed through two temporal fields about 4 cm. wide. The dose consists of about ⅓ to ½ H.E.D. In explaining the rationale of this procedure, Sahler calls attention to the close relationship between the function of the pituitary and that of the ovary.

Coley, William B., and Coley, Bradley L. Primary malignant tumors of the long bones. End-results in one hundred and seventy operable cases, including a small group of malignant central sarcoma. *Arch. Surg.*, Dec. 1926, xiii.

This is a very long article of which only the first portion has appeared. In it the authors conclude:

1. The prognosis of osteogenic sarcoma of the long bones, while far from satisfactory, is by no means as hopeless as is generally believed by physicians.

2. The prognosis depends largely on an early diagnosis and the exercise of most careful judgment in selecting the method of treatment for the individual cases; this should be based on a wide experience with a great variety of clinical and pathological types of bone sarcoma.

3. Amputation alone offers little hope of a permanent cure in any of these types.

4. Primary treatment with radium or roentgen rays, even if pushed to the utmost limits of safety, while often causing very marked improvement has thus far failed to effect a permanent cure in any case in which the diagnosis has been unquestionably established by clinical and pathological evidence.

5. The mixed toxins of erysipelas and Bacillus prodigiosus alone have effected a cure in a certain number of cases; but all of these cases have been of the round cell or spindle cell type, characterized by little production of new bone.

6. The mixed toxins and radium combined have likewise resulted in the complete disappearance and apparent cure of an even larger number of cases of a similar type; but neither toxins nor radium, singly or combined, have effected a cure in any case associated with marked new bone production.

7. Amputation followed by prolonged treatment with the mixed toxins in a series of 38 consecutive cases shows 50 per cent of the patients alive and well from three to eighteen years. This series includes all types of osteogenic sarcoma, as well as the cases associated with marked new bone formation.

8. In a similar series of cases treated by amputation alone without toxins or radium before or after amputation, not a single patient has remained alive beyond the three-year period.

9. The choice of treatment in a given case depends on whether it belongs to the group of round cell sarcoma (endothelioma, according to Ewing's classification) or to the group associated with marked new bone formation. If to the first group, the authors believe it is safe to try a combination of the systemic effect of toxins and the local effect of radium, the duration of the treatment to depend on the result obtained; if marked improvement is noted, the treatment may be continued until the tumor has entirely disappeared; but if no improvement is noted in from four to six weeks amputation should be performed, followed by prolonged systemic toxin treatment.

If the case belongs in the second group, the authors see no advantage, but a distinct disadvantage, in preliminary treatment with radium, roentgen rays or toxins, for the reason that metastases may develop during the period of treatment or may be hastened by the rapid breaking down of a vascular tumor, which permits living cells to be carried to the lungs or to remote parts of the body. Since their experience, supported by the results of other men, shows that there is no reasonable hope of saving the limb in this group of cases, the authors believe that amputation at the earliest possible moment followed by prophylactic toxin treatment offers the greatest hope of saving the life of the patient.

10. The fact that 10 inoperable cases of this series have been successfully treated with the mixed toxins alone or combined with radium, the patients remaining well from five to twenty-four years later, should prevent the abandoning of all hope in cases beyond surgical relief.

Goforth, J. L. Giant cell tumor of bone. *Arch. Surg.*, Dec., 1926, xiii.

Goforth summarizes:

1. The known behavior of the giant cell tumor warrants its being classified as a true neoplasm.

2. The giant cell tumors constitute a series. Those at the lower end of the scale possess

relatively adult fibrous stromas and are essentially benign. They exhibit more cellular and active stromas, composed chiefly of relatively immature fibroblastic cells, and become increasingly more locally aggressive as the scale is ascended.

3. Under the stimulus of inadequate or improper treatment, they may recur locally, those at the upper end of the scale being especially liable to this tendency. Such recurrences, as a rule, are more aggressive or virulent than the primary growth, both clinically and microscopically.

4. They are potentially malignant and may as a result of repeated or improper treatment excitation on rare occasions undergo malignant transformation and metastasize.

5. The giant cells, or osteoclasts that are characteristically present, function as bone absorbers, and are of osteoblastic origin. They are not reliable indexes of the neoplasm's relative malignancy.

6. The stroma is of fibroblastic origin and its behavior governs the course of the giant cell tumor. Thorough microscopical study of its cellularity, cell type and cell activity offers a fairly reliable criterion of the innocence or relative malignancy of the growth.

7. History, thorough clinical and roentgen-ray study, macroscopical and critical microscopical analysis, and a rigid follow-up are all necessary in establishing the final correct diagnosis and the true nature and behavior of the giant cell tumor.

Steinmann. Fracture surgery. *Internat. Clin.* Dec., 1926, S. 36, iv.

Meniscus Injuries. On the basis of about 200 meniscus operations, Steinmann states:

(1) In 63 per cent of the cases there is meniscus bipartitus (Steinmann), that is to say, a longitudinal tear, which separates the inner limb from the marginal limb, so that both remain in continuity anteriorly and posteriorly.

In 27 per cent of the cases, a fragment is torn away and hangs to the meniscus by a stalk.

Ten per cent of the cases consist of a tearing away of one or both ends, transverse tears and crushings.

(2) Injury of the medial meniscus is about twelve times as frequent as is that of the lateral meniscus.

(3) Injury of the medial meniscus occurs through sudden closure of the joint following sudden contraction of the thigh musculature with the leg flexed and rotated outward. The meniscus stretched like a bowstring in the joint cavity through external rotation is thus caught between the two internal condyles of the tibia and femur and cracked or torn, since it is pulled out of place by the tensed capsule, owing to the contraction of the vastus.

(4) The event may indeed take place without external influence.

(5) The most constant symptom is that of pain upon the external rotation of the flexed leg, which I first suggested.

(6) The sensitive swelling, often palpable on the joint line, is composed of a subsequent inflammation of the capsule and not of a luxation or subluxation of this to the outside.

(7) The roentgen-ray picture reveals no findings in meniscus injury, and serves merely for the exclusion of other affections considered in the differential diagnosis (arthritis deformans, injuries of the crucial ligaments).

(8) The incarceration of an alar synovial fat lobule in Hoffa's disease cannot be surely differentiated from meniscus injury and is only determined at operation, which is indicated for both conditions.

(9) Recurrent or chronic occurrences of locking are absolute indications for operation.

(10) Operation, with leg hanging at a right angle: Transverse incision through the skin. Smaller longitudinal incision through the fascia and joint capsule. Section of the internal limb at the anterior end with a scalpel. Section of the posterior end or of the stalk of a fragment with the especially devised Steinmann's meniscotome.

(11) After-treatment with immediate active movement and after some days of massage. Average stay in bed, nine days. Average time in hospital, sixteen days. After seven weeks, on an average, complete fitness for work. All patients became subsequently completely able for work.

Some New Surgical Procedures: (1) Temporary percutaneous nailing through driving in of a hollowed-out nail by means of a peg inserted into the cavity. The procedure may serve for the fastening of easily accessible fragments and for the retention of certain dislocations, e.g., those of the clavicle at both ends.

(2) Prevention of recurrent dislocation re-

sulting from torn ligaments of the acromioclavicular joint by means of a bony and periosteal flap reflected from the clavicle.

(3) Operation for habitual dislocation of the shoulder by means of a bone and periosteal chip, which is fastened to the anterior side of the scapula and overhangs the glenoid cavity about 1 to 1½ cm. Up to now no recurrence and complete function.

(4) Strengthening of the torn patellar ligament by means of wire loops through the patella and tuberosity of the tibia, to make possible the immediate active movement of the joint. Thereby rapid recovery of normal function.

(5) Operative setting of an angular healed fracture, especially of the tibia, without shortening by means of transverse osteotomy and insertion of a bony wedge obtained from the callus.

(6) Restoration of the transverse arch in flat-foot by means of a bolt perforating the first and fifth metatarsals and holding them together with two bolts. Definite bony fixation of the restored arch by means of subperiosteally implanted periosteal flaps. Very good result.

(7) Lengthening of an old fracture or of a congenital disturbance of growth resulting in shortened bones, by means of a screw splint with nail extension after oblique osteotomy, finally also transplantation of periosteum and bone.

SUPPLEMENTARY ABSTRACTS ON ROENTGENOGRAPHY AND RADIUM THERAPY

Abel, A. Lawrence. The treatment of cancer of the esophagus. *Brit. J. Surg.*, July, 1926, xiv, 131–159.

Cancer of the esophagus gives early symptoms and remains localized to the affected organ long after its presence can be definitely diagnosed. Moreover glandular metastases from carcinoma of the esophagus are the exception rather than the rule and the majority of sufferers from this complaint do not die from carcinoma but from starvation. Consequently this type of cancer is and almost always should be diagnosed at a very early date. It is the author's opinion that the only adequate form of treatment is surgical removal. Complete freedom from local recurrence should follow the operation, and late glandular recurrence should occur only in a minority of the cases. The details of the various types of operation are given. Radium, roentgen rays and diathermy are of very little value in the treatment of the disease except where palliation is intended.

The diagnosis can be easily established in the physical examination. Roentgenoscopy in the oblique position is preferred to roentgenography as a means of securing the necessary information. Even when no stenosis is present the roentgenogram may show retention of a small portion of the opaque substance at the site of an early lesion. If only slight stenosis is present no arrest of contrast fluid is seen, but a slight diminution in the caliber of the tube may be indicated. In the typical picture the barium passes through a malignant stricture and shows an irregularity at its lower extremity (rat tail like appearance). If it is proposed to treat the case with radium, it is essential that the total length of the malignant stricture be accurately determined. For this purpose retrograde roentgenography is employed. This is done by placing the patient in a slight Trendelenburg position, and the roentgenogram is taken while he is swallowing a fairly thick mixture of the contrast material; or it may be sufficient to have the patient lying horizontally with the right shoulder on the table and the negative placed against the posterior part of the left shoulder.

Esophagoscopy is of extreme importance especially in the earlier stages of the disease in order to establish an accurate diagnosis. In skilled hands this procedure is almost devoid of danger.

Andrei, Oreste. To what extent is it possible to tell the age of a fracture from the roentgen picture? *Chir. d. org. di movimento*, February, 1926, x, 255–293.

This question came up in connection with a medico-legal case in which a man claimed damages for a fracture sustained in an injury. Roentgen examination showed a healed fracture that must have dated from a time long before the accident. As a result of this incident Andrei made a study of a large number of cases of fracture and presents brief notes of them together with roentgenograms at different stages. He concludes that in simple fractures of the diaphysis without displacement of the fragments the first change that can be seen is a blunting of the edges and angles of the broken bone, which becomes visible at the end of the second week. The callus begins to appear between the sixteenth and twentieth days after the trauma; it is clearly defined from the third to the fourth month and regains the opacity of normal bone between the eighth and tenth months after the trauma. Within the first year after the fracture the bone does not

have a lamellar structure. Reconstruction of the system of lamellae begins in the thirteenth to fourteenth month and is well advanced at the end of the second year. The fracture line disappears between the sixth and eighth month after the trauma but later becomes evident again as a line of greater opacity in the bone. At the end of the second year, although the callus is greatly reduced, a trace of it can still be seen in the form of a thin and very opaque layer in the compact tissue of the bone.

In fractures of the diaphysis with displacement of the fragments the blunting of the margins and angles appears at the end of the second week and the callus becomes visible in the third or fourth week. It becomes demarcated from the neighboring tissues later than in the other fractures, that is during the sixth or seventh months, and at the same time takes on the opacity of normal bone. It is not absorbed so well as in fractures that have been well reduced and a definite time for the reconstruction of normal bone structure cannot be set.

In fractures of the phalanges, metacarpals and metatarsals there is a blunting of the margins and angles of the bone at the end of the first week. Within a little while afterwards, generally at the end of the third week and sometimes as early as the beginning of the second, the callus appears in the form of a delicate white cloud. At the end of the fourth month it is clearly defined and toward the sixth or seventh month it has the opacity of normal bone. During the first year the bone does not have a lamellar structure; this structure appears in the thirteenth or fourteenth month and is more or less advanced at the end of the second year. The fracture line disappears between the sixth and eighth month but becomes evident again later as a bone cicatrix.

Buonsanti, Paolo. The influence of surgical diseases on the development of the centers of ossification. *Chir. d. org. d. movimento*, December, 1925, x, 61–82.

In order to study the effect of various surgical diseases on the development of the bones the author made roentgenograms of the carpus in normal individuals and in patients with various surgical diseases, including tuberculosis of glands and of bones other than those of the carpus, acute inflammatory diseases, constitutional diseases, tumors and congenital and acquired deformities. The roentgenograms show that even in normal individuals there is great variability in the time at which the centers of ossification of the bones of the carpus appear. The time of their appearance varies as much as one to three years. They appear earlier in girls than in boys.

The various diseases studied did not appear to have any effect on the time of development of the centers, not even in a case of chronic suppuration from osteomyelitis in which the general condition was seriously affected. Apparently surgical diseases do not affect the organs which stimulate growth of bone. The practical surgical application of this fact is that the surgeon may prolong repeated bandaging and immobilizing treatment in diseases which require it, such as tuberculosis of bones and various orthopedic conditions, without any fear of damaging the development of the centers of ossification.

Burrell, L. S. T. The diagnosis and treatment of intrathoracic new growths. *Lancet, Lond.*, Feb. 27, 1926, i, 435–436.

No time should be lost in confirming the diagnosis of intrathoracic new growths; and when once it is confirmed the surgeon should be called in and time should not be wasted in trying radium or any other form of treatment. It is emphasized that non-malignant growths such as a dermoid or fibroma often prove fatal if ignored too long. The roentgen rays in the diagnosis of these conditions are very valuable. The injection of lipiodol or the induction of a pneumothorax may assist considerably in the roentgenographic diagnosis.

In the author's experience, roentgen therapy is very good in cases of lymphadenoma and sarcoma and should always be used. For other forms of intrathoracic growth, roentgen-ray and radium therapy were found disappointing; but they should be tried in cases which are inoperable. When operation is possible, it should be tried first. Syphilis must be carefully excluded before a final diagnosis is established.

Bustos, Fernando M. Sacralization of the fifth lumbar vertebra. *Semana med., Buenos Aires*, Jan. 21, 1926, xxxiii, 144–154.

This condition was first described in 1888 but it has only recently been found to be the cause of some painful conditions which have heretofore been diagnosed as sciatica or lumbalgia. In the first degree of the affection there is only increase in size of one or both transverse processes of the fifth lumbar vertebra; in the second they are increased until they come in contact with the sacrum, but there is no joint formed; in the third the process is very large and is connected with the wing of the sacrum by a true joint, in the fourth the process enters into relation with both the sacrum and the ilium; in the fifth there is a true synostosis between the transverse process and the sacrum, and in the sixth the synostosis includes the body of the vertebra also and may be called a

complete sacralization. Most authors say that there must be contact with the sacrum to constitute sacralization and that the first degree given above should therefore not be counted, but it sometimes causes the same painful syndrome as a true sacralization and may be called a pseudo-sacralization. Different degrees of sacralization may exist on the two sides. Anatomic sacralization sometimes exists without causing any symptoms.

The pain syndrome appears most frequently in men between twenty and forty years of age and is generally diagnosed as sciatica or lumbalgia. Physical examination often shows that the vertebral column has lost its normal lordosis and is straight; and there may be scoliosis of different degrees, crossed or homologous. Differential diagnosis from tuberculous spondylitis, spondylolisthesis and traumatic spondylitis may be made by roentgen examination. A valuable method of differentiation from sciaticas not caused by sacralization is to inject a local anesthetic to determine the segment from which the lesion originates. The roentgen picture may be confused in some cases by superimposed shadows. The fifth lumbar vertebra may be more or less wedged into the interiliac space and the shadows of the transverse processes, the highest part of the wing of the sacrum and the highest part of the ilium may be superimposed.

The condition is probably due to atavism. In examining the skeletons of anthropoid apes the author found that they have a symmetrical and bilateral fusion of the fifth lumbar with the sacrum, and in the South American natives there is often such a sacralization also.

There may be an infectious or traumatic element added to the sacralization in the causation of the pain syndrome and treatment for that should first be given. If medical and roentgen treatment are not effective, the transverse process or processes should be resected.

Dillingham, Frederick H., and McCafferty, Lawrence K. Bone syphilis. *Am. J. Syph.*, July, 1926, x, 373–382.

Three cases are reported; one of early periostitis, one of the thickening of the periosteum with osteoporosis of the bone cortex, and one of extensive osteomyelitis with thickening of the bone cortex and elevation of the periosteum.

When syphilis of the bone exists for any length of time there is present not only periostitis but at the same time various phases of bone pathology such as sclerosis, rarefaction and osteomyelitis. It is only in the beginning of bone syphilis that one sees the wavy, irregular line of the periosteum in the roentgenogram, which almost always signifies syphilitic periostitis. This picture is seen so frequently, that sight may be lost of the fact that syphilis may also cause the other definite lesions mentioned above.

One should be on the lookout for syphilis at the first sign of nocturnal pain. One should not treat too lightly the "aches and pains" of middle life, but should attempt to assign a definite cause rather than to classify them all under neurasthenia, rheumatism, etc. A roentgenogram should always follow a negative Wassermann reaction in cases presenting persistent nocturnal pains whether or not the history is suggestive of syphilis. The roentgenologist may not be able always to definitely differentiate bone syphilis from tuberculosis and other diseases of bone, but he can frequently aid the syphilologist in arriving at a tentative diagnosis. At times it may be necessary to resort to the therapeutic test, but this is infrequent.

Eades, M. F. Postoperative massive atelectasis. *Boston M. & S. J.*, Aug. 5, 1926, cxcv, 258–263.

Postoperative massive atelectasis is a frequently unrecognized pulmonary complication. The diagnosis is important in order to eliminate more serious conditions with which it may be confused. The cardinal clinical sign is displacement of the heart toward the affected side. In the involvement of the right lung, the cardiac impulse is frequently found at the left border of the sternum. If the left lung is affected the cardiac impulse may be found on the left anterior or mid-axillary line. The position of the heart should be verified roentgenographically in all suspected cases. This is especially important in the recognition of cases in which the lung involvement and the cardiac displacement are slight. In extensive involvement the affected lung shows a remarkable degree of uniform density comparable in some instances to that of the cardiac shadow. In some cases a definite deviation of the trachea toward the affected side is also evident. The roentgenogram may be the only means of differentiating this condition from embolism or infarct, owing to the varying degrees of the clinical signs and symptoms.

It is believed that bronchial obstruction and weakened respiratory movement in varying combinations produce postoperative massive atelectasis. The prognosis in cases of unilateral collapse is excellent; in bilateral involvement the outcome is liable to be fatal. No treatment has been found which influences the course of the condition.

GIAUME, CESARE. The etiology and pathogenesis of achondroplasia. *Pediatria*, April, 1926, xxxiv, 359–369.

A child thirty months of age had had an abnormally large head and short limbs at birth. In the early months of his life his head continued to develop rapidly and he was given a mercurial treatment with good results. The child himself has a one plus Wassermann reaction, while the father's reaction was 2 plus and that of the mother 3 plus. Roentgen examination showed exaggerated development of the vault of the cranium as compared with the face and the base. The bones were very thin, especially in the fronto-parietal region. The fronto-parietal suture was more prominent than the others. Because of technical difficulties the picture of the base was not clear enough so that the structure of the sella turcica could be determined accurately. The diaphyses of all the bones of the limbs were shorter than normal. There was no marked abnormality in their structure. In the arms the proximal and distal ends of the diaphyses were clearly visible but the epiphyses were not visible. The distal extremity of the ulna did not reach to the wrist joint. The radius was curved; the 4th metacarpal was shortened. In the legs the upper and lower ends of the diaphyses were clearly visible, but they were pointed. The distal and proximal epiphyses of the tibia were visible; the articular cartilages were somewhat smaller than normal; slight dorso-lumbar kyphosis and lumbar lordosis with marked forward inclination of the pelvis. No apparent change in the structure of the vertebrae. The lower limbs were 12 cm. shorter than normal while the arms were shortened only 1.5 cm. The proportion between the tibia and femur was almost normal while the radius was longer than normal in proportion to the humerus.

In addition to the classical signs of achondroplasia there were also some signs indicating rickets, such as the macrocephalia and the ogival form of the palate; also the enlargement of the thorax at the base and the costal rosary. But fetal dystrophy may extend to the bones of the trunk also. Possibly the two diseases coexisted in this case.

The syphilis was undoubtedly the cause of the disease in this case, though it may be produced by any toxi-infection acting on the fetus between the 4th and 6th weeks of development.

GIORDANO, D. Aneurysm of the abdominal aorta with gastric symptoms. Introduction of silver-plated wire into the sac of the aneurysm. *Ann. ital. d. chir.*, 1926, v, 125.

A man of forty-nine was sent to the hospital Dec. 13, 1923, for suspected tumor of the lesser curvature of the stomach. Fifteen years before he had contracted syphilis, for which calomel injections were given for a month, when he withdrew from treatment as he felt well. About seven years ago he began to have burning pain in the stomach, beginning about two hours after meals and lasting for an hour or two. Two years ago he lost 2 kilograms in weight and in addition to the burning sensation a feeling of weight in the epigastrium developed after meals, with pain lasting for one or two hours; acid eructation, constipation. For the past five months he had had epigastric pain radiating to the back. Roentgenoscopy showed a large defect in the lesser curvature which was assumed to be due to tumor. On examination he was found poorly nourished, with a clayey pallor and fetid breath from dental caries. Abdomen rather rigid with pain in the epigastric region, most intense in the midline beneath the ensiform process. The rigidity of the muscles made examination difficult but a tumor could be felt with an arterial pulsation which was thought to be transmitted. Roentgenographic examination showed the stomach large with a tendency to hypotonia; there was deformity of the shadow of the pylorus and antrum where pressure was painful.

Epigastric incision showed a pulsating retrogastric tumor the size of a fist, very evidently an aneurysm of the subdiaphragmatic aorta. A small copper wire plated with silver was passed into the aneurysm through a large syringe needle; 30 cm. of the wire was used. It was kept coiled, and coiled again in the aneurysm. Five c.c. coagulen was injected into the tissue around the aneurysm and the bleeding stopped. Uneventful recovery followed by intravenous injection of an arsenobenzol compound and intramuscular injection of calomel. A month after the operation roentgen examination showed that the end of the wire had uncoiled and risen in the aorta from the level of the 2d lumbar vertebra to the level of the 7th dorsal. Another examination after fifteen days showed the wire in the same position, and a semilunar segment of the lower and anterior part of the aneurysm appeared more opaque, as if from stratified clots adherent to the wall. As the patient felt well and was relieved of all his gastric symptoms he left the hospital and refused to return for further injections.

He was brought back May 12, 1925, by one of the nurses who was interested in the case. He had put on weight, his color was good and he felt well. Epigastric palpation still showed pulsation from behind forward, but no lateral expansion. Roentgenoscopic examination showed no expansion of the tumor. Roentgenographic examination showed that the

upper part of the wire had broken off and risen in the aorta, where it curved with the arch.

It is hard to say whether the improvement in this case was due to the introduction of the wire into the aneurysm or to the antisyphilitic treatment, but as it began immediately after the operation the author thinks it was due partly at least to that. The presence of the broken wire in the aorta is a cause for serious anxiety.

A recent article in the *British Journal of Surgery* reviews 3 similar operations; one of the patients died eight and a half months after the operation, the others within a few days. The authors advise gastroenterostomy after the insertion of the wire into an aneurysm for fear of acute dilatation of the stomach from pressure on the pyloric or prepyloric region. But in this case the operation not only did not cause any stomach symptoms but relieved those which already existed. It is hard to say whether this relief was due to the decreased expansion of the aneurysmal sac or to the section of sympathetic fibers in exposing the sac above the lesser curvature.

Guillemin, A. Roentgenoscopic diagnosis of gastrointestinal perforations: spontaneous pneumoperitoneum. *Arch. franco-belges de chir.*, August, 1925, xxviii, 684–702.

Sometimes the symptoms of a gastrointestinal perforation are so indefinite that diagnosis is difficult. Even as expert a gastrointestinal surgeon as Moynihan made an incision in the right iliac fossa in 18 out of 49 cases on a mistaken diagnosis of appendicitis. Guillemin describes 2 cases, one of violent abdominal pain in pneumonia and one of ruptured tubal pregnancy in which the symptoms were those of perforated gastroduodenal ulcer, and on the other hand, one in which the symptoms of a real perforation were so slight that the diagnosis was not made and the patient died.

In 1916 Lenk first used roentgen examination to diagnose perforations of the intestinal tract by bullets. He demonstrated a spontaneous pneumoperitoneum; the intestinal gas had accumulated between the liver and diaphragm which were pushed apart. A number of other authors have since used it in perforation of gastroduodenal ulcers and typhoid perforations of the intestine. Vaughan and Brams demonstrated free air in the peritoneal cavity in 13 out of 15, or 86.7 per cent of cases of typhoid perforation.

The author has made a systematic examination of all the patients who entered his hospital with signs of gastrointestinal perforation during the past year. He was able to make a diagnosis of perforation in 7 cases, 4 of perforation of gastroduodenal ulcer, 2 of perforated appendicitis and one of bullet wound. The tendency of the gas is to rise to the highest point so that if the perforation is above the mesocolon the gas will rise and collect between the liver and the right side of the diaphragm; the diaphragm will be immobile. But if the perforation is below the mesocolon the gas will strike the barrier of the omentum and transverse mesocolon and push them up. In low or appendicular perforation the gas may pass along the colon and accumulate under the diaphragm. If there are adhesions the gas may be encysted locally.

The method is a valuable aid in cases which are doubtful clinically. Its value is not absolute for a small accumulation of gas in a case with early adhesions may not be seen; but in that case, the perforation being covered, there is no great danger to the patient. In perforated gangrenous appendicitis there may be a question as to whether the gas is from a perforation or has been produced by anaerobic bacteria. The objection has been urged that it delays operation and that the patient may be injured by the change of position necessary for the examination. But an early diagnosis is a necessary preliminary to early operation and the making of an exact diagnosis by means of roentgenoscopy may hasten, rather than delay operation. The patient can be examined in a semi-reclining position and there is very little danger of breaking adhesions or of disseminating the infection.

Heuser, Carlos. Air in the bladder. Roentgenographic explanation of how it may cause death. *Semana med., Buenos Aires*, Jan. 28, 1926, xxxiii, 214–217.

So far the author has not had a case of death from insufflation of air into the bladder but he has had a case which explains how it may occur. He injected air in a case of suspected tumor of the bladder in which cystoscopy could not be performed on account of stricture. Some of the air escaped between the sound and the urethra and none could be seen in the bladder. A second insufflation was made and 30 c.c. lipiodol also injected. The latter could be seen in the bladder but no air. Another roentgenogram was taken including the kidney region and the ureters and kidney pelves were found distended with air to such an extent that the ureters looked like small intestine but were recognized as ureters from their position. If a little more air had been injected they would have ruptured. In a case like this if the walls of urinary canals were fragile air would infiltrate into the circulation and death result from embolism of the heart. Not more than 80 c.c. of air should be insufflated into

the bladder. There are probably many cases of reflux of air into the kidney but many of them have not been recognized because the air was thought to be in the intestine.

MASMONTEIL, F. Roentgenographic examination of the female genital organs with lipiodol. *Semana med., Buenos Aires*, Apr. 8, 1926, xxxiii, 737–738.

The author has used the method of lipiodol injection into the uterus and finds it is not in the least harmful or even unpleasant for the patient. It is a very accurate method of diagnosis for some gynecological conditions, including simple abortion, extrauterine pregnancy, fibroma and ovarian cyst. It is possible by means of it to show the cause of some cases of sterility, as it demonstrates impermeability of the tubes. It also sometimes shows incontinence of the tubes as the cause of menstrual intraperitoneal hemorrhage. In these cases the fluid injected collects in Douglas' pouch without causing any contraction of the mouth of the tube. Even in cases in which the liquid escapes into the peritoneal cavity it does no harm. In one case 20 c.c. of lipiodol flowed through the tube into Douglas' pouch. The patient did not feel any pain or inconvenience either at the time of the injection or afterward and laparotomy some days later did not show a sign of peritoneal reaction.

MILLER, RICHARD H. Cancer and diverticulitis of the large intestine. *Boston M. & S. J.*, Aug. 5, 1926, cxcv, 253–257.

The occurrence of indefinite lower abdominal symptoms in a person of cancer age should make one suspicious of cancer; and suspicion should always lead to an examination of the stool for blood, and, still more important, a roentgen examination after an opaque enema. In the diagnosis of cancer of the colon, the enema is much better than the barium meal. The same picture may, although infrequently, be caused by peridiverticulitis. The degree of operability cannot be determined from the roentgen findings. Cancer of the cecum is the hardest of all to diagnose. Operative treatment of these conditions is the only method offering any chance of cure. Irradiation with roentgen rays or radium has not yet been shown to be of any help.

Diverticulitis of the large intestine is not so uncommon as is ordinarily supposed and usually occurs in the sigmoid flexure. In any case which seems like appendicitis but in which the symptoms and signs are in the left side, diverticulitis should be suspected. For this, conservatism is preferable to radical surgery. In diverticulitis there is usually a history of repeated attacks with more or less fever. The roentgenogram will show up some diverticula but it is not to be depended on in making a diagnosis.

Five cases are presented showing difficult and unexpected problems in surgery of the large intestine.

MÜLLER, WALTHER. The development of coxa valga through epiphyseal displacement. *Beitr. z. klin. Chir.*, 1926, cxxxvii, 148–164.

Apart from the acute systemic diseases of the skeleton which lead to changes in the angle of the neck of the femur and other epiphyseal conditions terminating in coxa valga, there occurs a displacement of the epiphysis toward the neck of the femur in the lateral direction, a process which is of considerable importance in the understanding of most forms of coxa valga. The possibility for such a lateral shift of the cap occurs only in those particular cases where the space between the lateral acetabular edge and the upper lateral edge of the femur is greater than the greatest height of the cap of the femur. Wherever the edge lateral of the acetabulum and the upper lateral end of the neck of the femur happen to be separated considerably from one another, where larger lateral portions of the head are out of contact with the acetabulum, the epiphysis of the femoral head shows a tendency to lateral displacement over the neck of the femur.

In order to distinguish these relationships in the roentgenogram with complete distinctness, it is necessary to take the picture of the neck of the femur at a correct angle. The usual roentgenograms taken with external rotation of the limb are absolutely useless for this purpose, as they very easily give the impression of a certain shift of the cap toward the major trochanter. The necessary films must be taken with the limb in normal position or with internal rotation of the leg.

The consequence of a lateral shift of the epiphysis upon the neck of the femur is a coxa valga. The end of the femur appears straighter although the neck itself still maintains practically the same angle as in the normal. As in the case of coxa vara of adolescence, there later follows an adaptation of the contours of the femoral neck to the new position of the cap. The median edge of the femoral neck runs somewhat straighter in a convex curve and the upper edge runs toward the outwardly shifted lateral edge of the epiphysis and appears shortened. Through further osseous appositions to the now horizontally placed symphysis, there results subsequently a femoral neck which is really straight. Consequently the displacement of the epiphyseal joint will be

found fully developed in only a certain relatively early period, but the later genuine coxa valga is the end effect of this early epiphyseal displacement toward the outside.

This explanation permits an understanding of a variety of forms of coxa valga which have hitherto been only vaguely understood as regards their genesis. This is proven by an examination of the conditions in (1) coxa valga following flattening of the acetabulum (coxa valga luxans); (2) coxa valga due to vertical position of the pelvis; (3) coxa valga due to muscular tension; (4) coxa valga in genu valgum, and (5) coxa valga in inflammatory conditions. In most cases of these types, a shifting of the epiphysis toward the neck of the femur is the causative factor, the shift being laterally and upwardly. The condition permitting this lateral shift of the epiphysis, which takes place very gradually, is firstly the incomplete articulartion of the head only in its medial sections with a flattenning or vertical position of the acetabulum; and secondly, it may be caused by a permanent position of adduction of the femur.

Negro, Mario. Cystoscopy and roentgenography in calculus of the bladder. *Arch. ital. di urol., Bologna*, January, 1926, ii, 223–255.

Both cystoscopy and roentgenography are valuable aids in the diagnosis of vesical calculus and either the one or the other method suffices in a great many cases. But there are certain cases in which each method fails entirely or is insufficient for a definite diagnosis. Cystoscopy cannot be used in cases where it is impossible to introduce the cystoscope, as for example in children, in cases of stricture, in certain anomalies of the urethra and in calculosis of the urethra. And it cannot be used sometimes because of certain special conditions in the bladder, such as intense cystitis, which renders any distention impossible and copious hemorrhage or pyuria of the bladder which obscure the view. Cystoscopy may be insufficient or lead to mistakes in interpretation by reason of masses of detritus in the bladder such as blood clots or masses of pus, and in encrusted cystitis and encrusted tumors of the bladder. It may also fail in cases of calculi covered with clots and fibrin or ones completely enclosed in a mantle of organic tissue. And it may not show a calculus in spite of the cystoscopic picture being clear in calculi situated in a very deep vertex of the bladder which the cystoscope does not reach, calculi located in cystoceles or vesical herniae, calculi "capped" with a piece of vesical mucous membrane, or calculi in vesical diverticula.

Roentgen examination may fail to show a vesical calculus because of excessive thickness of the walls of the abdomen which renders the bladder region opaque, or because of the chemical composition of the stones. Uric acid calculi and ones composed of ammoniacal calcium urate are not visible. Roentgen examination may lead to mistaken diagnoses in cases of shadows cast by encrusted bladder tumors, encrusted cystitis or encrusted clots or masses of pus or by reason of certain paravesical lesions impermeable to roentgen rays, including calcified cysts of the pelvis, dermoid cysts, calcified gummata and intestinal calculi.

As each of the two methods may be insufficient in the conditions outlined above and as the causes of failure are not the same for the two methods errors of diagnosis in calculus of the bladder can be greatly reduced by making systematic use in doubtful cases of both cystoscopy and roentgenography.

Pehu, H., Chassard, M., and Enselme, Mme. J. Roentgen study of congenital syphilis of the long bones in early infancy. *J. de radiol. et d'électrol.*, February, 1926, x, 54–68.

The author has made a study of the roentgen picture of syphilis from birth to two years of age and presents plates showing the results. There are four forms, the first two of which are rare. The gummatous form is very unusual although it is frequent after three years of age. The osteomalacic or destructive form is also unusual; it presents various phenomena due to dystrophy of bone tissue. The bones are very fragile and these infants often have multiple fractures. There seems to be a sort of rarefaction of the spongy tissue, a variety of osteoporosis. The roentgenograms show notches or lacunae, a dentate or worm-eaten appearance at the ends and along the edges which represent either true losses of substance or a rarefaction of the bone. There are no clinical symptoms and the condition is discovered only by roentgen examination.

The two other forms are frequent. Wegner-Parrot's osteochondritis is a disease of intrauterine life. It is generally discovered only by roentgen examination, for Parrot's pseudo-detachment of the epiphysis is the clinical manifestation of its maximum degree. It is only exceptionally found after the third month of life. It is characterized by dentate processes extending from a variable depth between the proximal face of the articular cartilage and the juxta-epiphyseal part of the spongy tissue. The process of calcification does not follow a normal course. Instead of being superimposed, as they are normally, the zone of calcification and that of cartilage inter-

penetrate each other reciprocally and irregularly. Osteogenesis is excessive in some places and defective in others. Soon necrobiosis occurs, due doubtless to defective arterial circulation, which alters the spongiosa already formed and the periosteum itself presents signs of hyperplasia. The fourth form, ossifying or hyperplastic periostitis, is found in 80 per cent of cases of syphilis in early infancy. Generally it shows no clinical symptoms. In the majority of cases it appears with absolute symmetry in the bones of the four limbs. It is an extra-uterine disease beginning in the first three months of life and extending up to the 18th month. The roentgen picture is almost pathognomonic. It is caused by the embryonic layer of the periosteum becoming affected by the syphilitic infection. Under the influence of the irritation caused by the spirochetes this layer manufactures granulations which penetrate the cortex and finally become encrusted with calcium salts. There is a sheath of calcified periosteum which often surrounds the whole length of the long bone; its outlines are generally regular but sometimes there are localized projections.

Roberts, R. E., and Cohen, Morris J. Osteitis deformans (Paget's disease of bone). *Proc. Roy. Soc. Med., Lond.*, March, 1926, xix, Sect. Electro-Therap., 13–40.

Sixteen cases of osteitis deformans are recorded (11 males and 5 females). The general features observed conform to the more than 300 human cases that have now been recorded in the literature.

The etiology of the disease is doubtful. The factors that have been suggested as possibly responsible are (1) toxins; (2) endocrine disturbances; (3) heredity or environment, and (4) syphilis. In the present series, 2 of the patients were sisters, and 2 others showed a positive Wassermann reaction. In only 2 cases did the symptoms appear before the age of forty. In 11 cases the earliest symptom was pain in the lower limbs. Muscular weakness, cramps, deformities, fractures and head enlargement were usually later manifestations. In 3 cases spontaneous fracture of the femur occurred; in one case twenty incomplete "cracks" were found roentgenologically in the convex anterior border of the tibia, and three in the femur. The pathologic process in Paget's disease is one of "halisteresis" or a progressive decalcification and resorption of the old bone and replacement by an osteoid tissue.

The roentgenographic appearances illustrate the various stages of this pathologic process. In the skull the earliest roentgenographic change is a blurring of the outline of the calvarium with, as a rule, thickening and "flattening." The later changes are those produced by progressive thickening with irregular calcification in the osteoid tissue, frequently affecting the base as well as the vertex. Enlargement of the pituitary fossa was shown in 3 cases.

In the long bones one of the features is the production of "trabeculae" in the thickened cortex. These are at first faint, gross, and ill defined, but later become denser and more sharply defined. The stage of the disease in any bone can be gauged by the type of trabeculae shown in the roentgenogram. Fractures occurred only when the bone was in the early amorphous or faint, blurred, trabecular stage. Occasionally, as in the metacarpals the roentgenographic shadows indicate a dense, granular deposit of calcium in the thickened cortex; in the os calcis the appearances may be merely those of coarse trabeculae along the normal lines of lamellation.

In 8 cases of the present series the diagnosis of the disease was primarily roentgenographic. Characteristic roentgen changes were found in the skull in 15 cases, pelvis 15 cases, femur 15 cases, and tibia 15 cases. Roentgen changes were often found in parts quite unsuspected of disease of any sort. This emphasizes the necessity for: (1) local roentgenographic examination of cases of obscure limb pain; (2) general roentgen examination of the skeleton (especially skull and pelvis) in all cases where suggestive local bone changes have been found. Where the local roentgenographic changes suggestive of "osteitis fibrosa" were found, a general roentgen examination invariably showed appearances which were characteristically those of "ostetitis deformans." Roentgenologically it is impossible to differentiate between generalized osteitis fibrosa and osteitis deformans. Osteitis fibrosa cystica which may be localized to a single bone is probably a different disease or at any rate a different type.

The treatment of osteitis deformans is at present very unsatisfactory.

Van Dessel, Arthur. Calcification of gliomas of the brain. *Arch. franco-belges de chir.*, October, 1925, xxviii, 845–874.

With recent improvements in roentgen technique, including the introduction of reinforcing screens, the use of the Potter-Bucky grid for eliminating secondary rays, combined with the stereoscopic method, calcifications can be demonstrated now that could not have been shown a few years ago. In an examination of Cushing's material since 1921 the author found that 17 out of 126 gliomas of the cerebral

hemispheres, or 13.5 per cent, showed calcification. This does not include the cerebellar gliomas, only two of which showed calcification. It is possible that cerebellar gliomas because of their position do not have as long a life as those of the cerebrum and so do not calcify so frequently, or it is possible that the calcification does not show so well because of superposition of the shadow of parts of the petrous bone. One old case of glioma from 1907 which was not roentgenographed before operation was examined and showed calcification. The author gives the clinical histories and several roentgenograms of the 17 cases of glioma which presented calcification. A study of these cases shows that such gliomas can be accurately localized by roentgen examination. The calcification is found chiefly in gliomas made up of highly differentiated cells, which are therefore the ones in which the prognosis is most favorable. The operative mortality in these cases is very low. The calcium salts are deposited almost exclusively in the walls of the vessels after they have undergone hyaline degeneration.

Wilkie, D. P. D. Coincident duodenal and gastric ulcer. *Brit. M. J.*, Sept. 11, 1926, ii, 469–470.

The author examined 490 bodies post mortem for duodenal ulcer. In 41, one or more such ulcers were found (8 per cent). In 5 cases one or more gastric ulcers were present along with the duodenal ulcers. That is, in 12 per cent of cases of duodenal ulcer a coincident gastric ulcer was found. During the past five years an experience with 300 operated cases of ulcer gave the following incidence of involvement:

	Male	Female	Total
Duodenal ulcer alone	167	54	221
Gastric ulcer alone	17	20	37
Coincident duodenal and gastric ulcer	27	15	42
Totals	211	89	300

The roentgen-ray picture after a barium meal is an important element in the accurate diagnosis of this condition. In the early cases, the roentgen evidence of gastric ulcer may be a little uncertain, and may be confined to a slight irregularity of outline of the lesser curvature with some degree of spasmodic hour-glass contraction. In the advanced cases where stenosis has occurred, the very typical picture of hour-glass stomach and duodenum leaves no doubt as to the diagnosis.

Two groups of cases are to be distinguished when considering operative measures: (1) Active ulcers without stenosis in persons under fifty years of age; and (2) unhealed but cicatrized ulcers with stenosis, in elderly subjects. The Balfour operation is recommended for the first group, while for the second group purely anastomotic operations give a lasting cure.

It seems clearly demonstrated that coincident ulceration in the stomach and duodenum is relatively common. In this series it occurred in 16 per cent of all duodenal ulcers and in 53 per cent of all gastric ulcers.

Van Neck. A case of sacralization of the fifth lumbar vertebra. *Arch. franco-belges de chir.*, June, 1925, xxviii, 505–510.

A girl aged eighteen after a fall from a streetcar began to have pain in the right lumbar region which increased progressively. There was a very audible and painful cracking sound when she bent forward and the limp increased until she had to walk with crutches. Roentgen examination showed sacralization of the 5th lumber vertebra on the right, but there was a striking discrepancy between the roentgen and operative findings. The roentgenogram showed a large transverse process which reached the iliac bone; it was very large at the base and seemed to be connected with the sacrum also. Operation showed a process not larger than a pencil which was directed forward and attached to the iliac bone 1 cm. below the crest by solid ligaments. It was very hard to remove on account of its close attachment by ligaments to the pelvis and sacrum and because of the copious hemorrhage. Its point of implantation on the vertebra could not be seen. Although the process was not completely removed the pain stopped at once but the cracking sound and the scoliosis were not completely corrected until after about two months.

Zanoli, Raffaele. Congenital luxation of the patella. *Chir. d. org. di movimento*, December, 1925, x, 83–164.

Zanoli gives clinical histories of 13 cases, profusely illustrated by photographs and roentgenograms. This is an unusual affection; Karl in 1921 collected 137 cases and 15 have been published since then, making a total of 152. The condition is markedly familial and is frequently accompanied by other anomalies of development, such as luxation of the hip, flat-foot, scoliosis, etc. In one of the author's cases there was complete absence of the joint menisci and the crucial ligaments of the knee-joint. This anomaly has never been described before. The patient's father was syphilitic and she had a doubtfully positive Wassermann.

After discussing the various theories of pathogenesis, the author concludes that con-

genital luxation of the hip is due to an anomaly in the position of the joint axes, that is to an external rotation of the tibia and an inward rotation of the distal epiphysis of the femur, due to mechanical factors during intrauterine life.

Solieri reports that roentgen pictures of the knee-joint show that in hyperextension the patella occupies the supratrochlear fossa, while in extension the upper part is in the supratrochlear fossa and the distal part in contact with the trochlear. In moderate flexion the patella moves downward still more, so that only part of it is in relation with the trochlea, and in extreme degrees of flexion it lies entirely in the intercondyloid fossa. The author's roentgenograms of normal individuals confirm those of Solieri and show that in extension the patella occupies the trochlear region, while in flexion it lies lower down and occupies the intercondyloid fossa. He also examined fetuses from 8 to 25 mm. in length; all of them were in the physiological flexed position of the fetus in the uterus and the patella was somewhat higher than in the flexed position of the infant or adult. In those 8, 11, 12 and 14 cm. in length the upper two-thirds of the patella lay at the level of the trochlea, while the lower third was in the intercondyloid fossa, while in fetuses 18 and 25 cm. in length it had moved down until half of it lay in the intercondyloid fossa.

The roentgen pictures in congenital luxation show the patella displaced outward, more or less marked decrease in the intercondyloid fossa, and a marked decrease in the articular fossa of the tibia, which in some cases occupies only a small part of the internal articular surface of the bone. The roentgenogram in some cases shows an inward displacement of the axis of the femur, a real lateral displacement and not the simple deviation of valgus. In the lateral projection the outlines of the lower epiphysis of the femur in some cases are rather flattened and the margins of the two condyles are not superimposed.

There are four chief methods of treatment of this condition: operations on the bone, operations on the ligaments and capsule, operations on the muscles, and mixed operations. The author used various methods in his cases and comes to the conclusion that perhaps the best one is combined median transplantation of the patellar tendon and capsulorrhaphy. In connection with median transplantation of the patellar tendon he emphasizes one point in technique, namely the disinsertion of the quadriceps tendon. He used this method in 4 of his cases and in one of them particularly after having cut the insertion of the vastus externus and the lateral attachments of the patella he could flex the knee without luxation of the patella. This detail of technique is justified by the fact that one of the most characteristic changes in this affection is external displacement of the whole extensor system—quadriceps, patella, patellar tendon—and this is the best method of restoring the extensor apparatus to its normal relations, re-establishing normal function and guarding against recurrence.

Béclère and Siredey. Intra-abdominal tumor cured by roentgen therapy without recurrence after five years. *Bull. Soc. d'obst. et de gynéc. de Par.*, March, 1926, xv, 166–167.

A woman aged fifty-four, teacher and directress of a school, was examined in June, 1920 and showed an unusual splenomegaly without leucemia which could not be attributed to malaria, syphilis or tuberculosis. In June, 1916, she had had a tumor the size of a fist removed from the external orifice of the left inguinal canal. She had never menstruated. As a matter of fact, though she had all the appearance of being a woman it was a case of external masculine pseudohermaphroditism. At the external orifice of the right inguinal canal, exactly symmetrical with the operation scar, there was a smooth hard oval body pressure on which caused nausea. It was assumed to be testicle and it was found from the histological report that the tumor removed some years before had been a seminoma. A diagnosis of metastatic seminoma of the spleen was made and roentgen treatment begun July 3, 1920 and terminated Dec. 16 the same year, 20 treatments having been given, at first weekly and later at longer intervals. Ten days after the first treatment although small doses of moderately penetrating rays had been used the spleen had greatly decreased in size; a month and a half later it was normal in size. The irradiations were continued as a precautionary measure. Seminomas and their metastases are very radiosensitive. At present ten years after the original operation and five years after the roentgen treatment of the metastasis there are no signs of recurrence.

Bégouin. Two cases of death from intrauterine use of radium. *Bull. soc. d'obst. et de gynéc. de Par.*, February, 1926, xv, 137–138.

Among the 137 cases in which the author has used radium within the uterus for cancer of the body of the uterus or the cervix he has had one case of slight peritoneal reaction with recovery and two deaths. The first was a case of basal cell epithelioma; on account of the

patient's stoutness and the depth of the vagina he thought either abdominal or vaginal hysterectomy was dangerous and so used two tubes of radium tandem; each contained 13 mg. radium element filtered through 0.5 mm. platinum and 2 mm. gold, all enclosed in a tube of metallized rubber. The radium was applied Nov. 24, and removed Nov. 28. As the number of millicuries was insufficient the radium was re-introduced; for the next few days the patient's temperature varied between 36.4° and 37.8°c. On Dec. 3 the radium was removed and that evening her temperature rose to 38.4°c. On the 5th her abdomen was distended, her general condition bad and the bases of her lungs congested. On Dec. 9 she died. Autopsy showed the abdomen full of pus and a large triangular perforation of the uterus on the posterior wall at the site of the cancer.

He had another similar case of death where radium was introduced into the uterus for cancer of the cervix but in this case, an autopsy did not show any perforation of the uterus; the infection must have taken place by the lymphatic route.

Commandeur-Eparvier and Michon. Cancer of the cervix of the uterus and pregnancy; Caesarean section; Porro's amputation; radium therapy. *Bull. Soc. d'obst. et de gynéc. de Par.*, January, 1926, xv, 59–62.

A woman aged forty who had had four children, the last one ten years of age, was sent to the hospital July 31, 1925 for a seven months pregnancy and cancer of the cervix. During the night of the 21st of August she had a very severe hemorrhage. Her general condition was very bad and the pulse could not be felt. She was given stimulants and the next morning a classical Caesarean section was performed under ether anesthesia. A normal girl weighing 3000 gm. was extracted. Porro's amputation was performed at once and the abdomen closed. Two weeks after the operation the gangrenous part of the stump was resected. The cervix was dilated by Hegar bougies up to No. 12 and two tubes of radium bromid containing 50 mg. each introduced through the abdominal orifice; usual quadruple filtration. Three tubes of 75 mg. each were placed in a circle around the cervix. Therefore a total of 325 mg. radium bromid was applied for seventy-two hours, or 57.6 mc. After removal of the tubes transcervical drainage was established for a week. Three days after the tubes were removed her temperature rose and oscillated between 37° and 39° for eleven days and during this time there was incontinence of urine. The patient weighed 60 kilograms on Aug. 1 and on her discharge Nov. 6 she weighed 45 kilograms. During the last fifteen days of her stay she regained her appetite. Vaginal palpation three weeks after the radium was applied showed that the large cervical tumor had completely disappeared. The cervix was small and hard; there was slight induration in the cul-de-sac on the right.

Michon believes that this method of applying radium through the abdominal orifice after Porro's amputation is a very satisfactory technique. If radium is used during pregnancy it should be applied only in the vagina. Intracervical application is generally followed by abortion or premature delivery.

Coutard, H., and Regaud, Cl. Results and technique of roentgen therapy of cancer of the cervix of the uterus. *J. de radiol. et d'électrol., Par.*, April, 1926, 151–154.

From 1920–1923 the authors treated 32 cases. All except one were absolutely inoperable. The patient who was operable died. Treatment with radium after failure of roentgen rays brought about only temporary improvement. Of the 31 inoperable cases 6 were not able to stand the treatment and it had to be given up. Of the remaining 25, seven are still alive and free of symptoms of cancer one was treated in 1920, one in 1922 and 5 in 1923; this give 28 per cent cures. Most of the patients not actually cured were greatly improved and some of them are living two and three years after treatment.

Three methods of treatment have been followed: (1) by roentgen rays alone: 12 of the 32 cases were treated in this way; in 3 the treatment had to be given up and 4 of the other 9 are cured, or 44.4 per cent; (2) treatment first by radium and then by roentgen rays; most of the 10 cases treated in this way were ones of recurrence after radium treatment and none of them recovered. This confirms what the authors have found in skin cancer, namely, that roentgen rays are ineffective after radium treatment; (3) treatment by roentgen rays first followed by radium treatment; 10 cases were treated in this way and 3 recovered, or 33 per cent.

The authors have never had any serious skin reactions. In the early period of their treatment when they were using relatively small skin fields and a filtration of 1 to 1.5 mm. zinc they frequently had more or less disturbing intestinal symptoms and changes in the circulation and blood picture, but since enlarging the fields and using 2 to 2.5 mm. zinc they have never had any of these symptoms.

Their present technique is to use a maximum tension of 180 kv., a filtration of 2.5 mm. zinc,

skin-anticathode distance of 0.50 to 0.75 meters and fields of 375 to 450 sq. cm., the number depending on the case. The Germans in general prefer small fields and slight filtration, 0.5 to 1.0 mm. zinc or copper, and try to measure very accurately so that the rays shall strike only the tumor and not the surrounding tissues. But as such determination of the exact limits of the cancer is almost impossible the authors prefer to use less dangerous and more elective rays. Of course this involves loss of time and the methods of quantitative dosimetry are not very satisfactory. Their skin doses amount to about 60 H units for one-half of the pelvis (about 14,000 Solomon's R units) or for the whole of the pelvis 100 to 120 H. They never exceed 4 to 5 H units (1100 to 1200 R units) per day. The maximum time of treatment is twenty-five days; the results are not so good if it is extended farther. Perhaps it would be well to reduce it to fifteen days or even less, but that is difficult with the tubes now available and besides it produces intolerance in the patient. The total irradiation time is twenty-five to fifty-five hours according to the size of the territory irradiated.

Di Sant'Agnese, V. Artom. Radium treatment of cancer of the cervix and the cervical canal. *Clin. ostet.*, May, 1926, xxviii, 223–233.

The best field for radium treatment of cancer of the cervix is in inoperable cases. The author has treated 413 cases exclusively with radioactive substances. He has used either radium or mesothorium, giving 3 to 4 applications of twenty-four hours each distributed over fifteen to twenty days: dose 50 mg. radium element. If possible an intrauterine or intracervical focus with foci in the vagina for cross fire. Filtration for mesothorium through 1 mm. of brass and for radium through 1 mm. of gold and platinum; external tube of rubber to absorb the secondary radiation. For the applications in the vagina the radium was covered with cork and outside that with rubber. He has found needles useless except to destroy cauliflower vegetations. He does not use an intrauterine focus if it is necessary to dilate the cervix, for fear of dissemination, nor does he advocate the introduction of tubes through incisions in the fornix of the vagina or the abdominal wall.

Among the 413 cases 25 are excluded on account of recurrence and 170 because operated on since 1920, so the five-year results are not known. This leaves 218 operated upon five years or more ago. Of these 16, or 7.34 per cent, are definitely known to be alive and well. Reports have been received from only 50 per cent and it is probable that there are others still living; they were mostly domestics or working women and it is hard to get in touch with them because of their frequent changes of address. While this is not a high percentage of cures it is to be remembered that they were all inoperable cases, many of them far advanced and no selection was made. In one of the cured cases the treatment was given without any hope of cure, only because the family insisted.

In another series of 127 cases treated successively with radium and roentgen rays since 1920, thirty-five, or 27.6 per cent, are alive after two years or more, which is a high percentage considering that they were all inoperable and some of them advanced. During this same period radium treatment alone has given 19 survivals out of 130 patients, or 14.3 per cent. The combination of radium and roentgen rays would seem from this to be superior to radium alone. In spite of the doubts of its value expressed by Regaud, radium followed by roentgen rays is effective, although roentgen rays followed by radium are more so. The reason the author has sometimes given radium first is to avoid the general disturbance that sometimes follows the primary use of roentgen rays.

In still another series of cases he has used radium following hysterectomy. While this would seem dangerous on account of the removal of the uterus and the close proximity of the bladder and rectum he has found that two treatments of twenty-four hours each with 50 mg. radium element with an adequate metal filter and 2 cm. of cork are well borne. He has never had any injury from this treatment which he has used in 32 cases. It is particularly valuable for preventing recurrence in the vaginal scar. Since 1920 he has used a combination of radium and roentgen rays when possible. Among 29 cases he has had 17 survivals for two years, or 58.6 per cent; among 25, fourteen survivals for 3 years, or 56 per cent, among 14, six survivals for four years or 43 per cent. He thinks therefore that it is better to perform a less radical operation than the Wertheim and follow it up with roentgen and radium therapy than to perform the Wertheim operation.

Edling, Lars. Treatment of surgical tuberculosis by roentgen rays. *Paris méd.*, Feb. 6, 1926, xvi, 127–132.

The best field for roentgen treatment is in tuberculous adenitis. There are three forms: (1) simple hyperplastic lymphomas; (2) closed lymphomas with central caseation or suppuration, and (3) abscessed glands with fistulas. In groups 1 and 3 roentgen treatment should be

given in the beginning as it cures the majority of cases. Isolated and mobile lymphomas which prove resistant to roentgen therapy should be extirpated. In group 2 where there are abscesses in the center of the lymphomas they generally come to the surface on roentgen treatment and recovery follows. But caseous foci in the center are very hard to cure. Roentgen treatment should not be pushed too far in these cases, but the resistant glands should be extirpated. Recurrences and cases already operated upon should always be irradiated.

The author has collected 270 cases of lymphoma treated by irradiation: 73 per cent were cured and there was improvement in 14.8 per cent; 8.5 per cent had relapse and 3.7 per cent died of the tuberculosis or an intercurrent disease. Small doses should be used (1/3 to 1/4 skin erythema dose) with 3 to 4 mm. aluminum filter, or in exceptional cases 0.5 mm. zinc or copper, given at intervals of four to six weeks. Larger doses are dangerous.

The prognosis of tuberculous peritonitis has improved considerably since the introduction of roentgen treatment. Irradiation should be given at once in plastic-adhesive cases, in cases which are inoperable because of the poor condition of the patient and in cases in which the patient refuses operation. Exudative forms should be operated on first and irradiated afterwards, though mild exudative forms may also be irradiated at once. Serious consequences may result from an excessive deep dose so some caution is necessary. Jüngling calculates the dose according to kilograms of weight, or 4, 6, or 8 fields may be used and each irradiated with a small dose, 1/5 to 1/3 skin erythema dose. The maximum filter should be 4 mm. aluminum, the minimum interval between treatments four to six weeks.

The results of surgery in renal tuberculosis are so good that roentgen treatment is scarcely indicated except in inoperable cases. Its only indication in vesical tuberculosis is when the renal tuberculosis, which is generally the cause of it, is bilateral and therefore inoperable. Steppe has filled the bladder with collargol in vesical tuberculosis in order to make use of the secondary radiation from the particles of metal in suspension; but in general the indications for roentgen treatment in bladder tuberculosis are very doubtful. Surgeons in general prefer epididymectomy or castration in cases of unilateral tuberculosis of the epididymis, though roentgen treatment may be used in mild cases. Irradiation is indicated when the disease is bilateral or when after extirpation on one side the disease appears on the other.

Vogt was the first to use roentgen therapy in tuberculosis of the female genitalia; among 14 patients treated exclusively by roentgen rays 6 recovered, 3 were considerably improved, 2 died and 1 did not improve. Weibel had 82 per cent good results and 18 per cent mortality. Vogt thinks roentgen therapy is indicated in cases of tuberculous endometritis without peritoneal or adnexal symptoms, in cases where operation is contraindicated and in bilateral adnexitis. But the most important use of roentgen treatment in these cases is postoperative and the percentage of cures has been increased from 66 to 87 by its use. Vogt uses large fields and long intervals; he gives 50 per cent erythema dose while Jüngling recommends only 10 to 20 per cent.

Great care must be exercised in the roentgen treatment of tuberculosis of the larynx because of the danger of injuring the larynx; and as tuberculosis of this organ is almost always secondary to that of the lungs the prognosis depends greatly on the primary disease. The best technique is to use 8 to 10 Kienböck units with a focal distance of 24 cm. and a filter of 4 mm. aluminum over three fields, one in front and one on each side of the larynx for a week; the next week the series may be repeated and then the treatment stopped for three weeks.

In general the results of roentgen treatment are good in bone and joint tuberculosis but they are not equally good in all the joints and recovery is slow and begins with an indolent stage of long duration. So the cases have to be followed up for several years and suitable general treatment should be given in connection with the irradiation. Great care must be used in dosage as lesions, not only of the soft parts but also of the bones, may be caused by relatively small dosage, particularly in the lower limbs. Not more than 20 to 30 per cent skin erythema dose should be given, or in very deep lesions 40 to 50 per cent, less in children than in adults. Among the forms of bone tuberculosis the one that gives the best results in roentgen treatment is spina ventosa. Costal tuberculosis is often the starting point of tuberculous pleurisy and therefore roentgen treatment is rather dangerous; light baths are to be preferred. In tuberculous spondylitis the time required for cure is often greatly shortened by roentgen treatment, and the same is true of sacroiliac tuberculosis. Roentgen treatment is to be preferred to surgery in tuberculosis of the wrist and joint and operation should be almost entirely given up in scapulo-humeral tuberculosis. The results of roentgen treatment are not so good in tuberculosis of the knee and ankle; there are often recurrences which have to be operated upon finally. This is possibly due to the poorer circulation as compared with the arm, and possibly to the irritation from walking.

Ferroux, R., Monod, O., and Regaud, Cl. Treatment of cancer of the neck of the uterus by radium at a distance; technique and first results. *J. de radiol. et d'électrol., Par.*, January, 1926, x, 21–23.

The authors now have 4 gm. of radium available. They at first used it at a distance of 6 cm., then of 8 cm. and now of 10 cm. The frame for carrying the radium is supported by a modified roentgen tube stand. The frame is a rectangular plate 11 × 14.5 cm., entirely covered by 80 tubes each containing 50 mg. radium. The gamma radiation is filtered through the equivalent in platinum and brass of 1 mm. platinum. Protection is by 2 cm. lead. The distance from the skin is maintained exactly by a localizing tube of wax lined with 1 cm. lead interposed between the radium and the skin, the opening of which, closed by a plate of wax, is moulded to the part to be irradiated without the weight of the apparatus resting on the patient. There are 2 to 7 portals of entry which may be anterior iliac, sacro-iliac, lateral ilio-femoral or vulvo-perineal, depending on the localization and volume of the tumor to be treated. The doses which at first were 500 millicuries have now been increased to as high as 2 curies. The time of treatment has now been reduced to 12–15 days with one or two treatments a day.

Since August, 1924 they have treated 32 patients with cancer of the cervix, 26 of them absolutely inoperable; sometimes the above treatment was used alone, more frequently it was combined with utero-vaginal radium treatment. Of course it is too soon to report final results, but the work so far has shown that the organism can tolerate large doses of gamma rays filtered through 1 mm. platinum, distributed over a large pelvic field better than it can roentgen rays even if filtered through 2.5 mm. zinc. Most of the patients had only very slight objective and subjective symptoms belonging to the syndrome caused by penetrating irradiation. There were transitory changes in the blood which are being studied. Seven patients showed slight and temporary digestive disturbances, colic, diarrhea, nausea, which seemed to begin about the time the treatment was shortened and the dose increased. No signs of infection were seen, which indicates that this method decreases the resistance of the tissues to infection less than other methods of irradiation. There were slight skin changes, erythema, pigmentation, dry desquamation when treatment was given at a distance of 6 cm. but no such changes have been seen since the distance was increased to 10 cm. The effectiveness of gamma irradiation is proved. Cancerous infiltrations of pelvic connective tissue which do not yield to utero-vaginal radium therapy because of their superficial localization, disappeared entirely. Among 22 cases treated the first year 16 show no signs of cancer. As the limit of tolerance of the tissues has not yet been attained with the present dosage the results will doubtless improve as the maximum dosage is determined.

Gayet, G., and Peycelon, R. Treatment of cancer of the prostate. *Arch. franco-belges de chir.*, Sept., 1925, xxviii, 759–781.

From 1912 to date the authors have observed 106 cases of cancer of the prostate. They exclude the cases from 1912 to 1914, performed in the early days of radium therapy before the technique was well developed, and those treated in 1925 as being too recent. This leaves 71 cases, in 33 of which it was impossible to do more than give palliative treatment because of the advanced stage of the disease. The other 38 were given radium treatment. They used tubes of 49 to 50 mg. containing 53 per cent radium element; they almost always used two tubes simultaneously; in 14 cases they left the tubes in place twenty-four hours, but since 1921 they have irradiated for forty-eight hours in 23 cases. In the beginning the total dose was 9 millicuries; since 1921, 18 mc. and in some cases of repeated treatments 27 or even 36 mc. In the majority of cases they used the perineal route, puncturing with a trocar by Marion's method; in 14 cases they used the hypogastric route, the tube being placed in contact with the tumor after cystostomy or placed in the bed of the prostate after enucleation of the gland. In 7 cases they used the rectal route, with triple filtration through tubes of platinum, silver and rubber. They used the urethral route in only 3 cases. They never implanted needles directly in the tumor after perineal incision and exposure of the prostate. In one case they implanted 6 needles in the floor of the bladder after hypogastric section and left them in for ninety-six hours; the result was bad and the cancer continued to progress. In 8 cases they performed transvesical prostatectomy before using radium.

Among the 38 cases treated 15 have disappeared since the year following the treatment and nothing is known of them. Nineteen are dead; 4 of them survived the treatment less than a month; 5 for two months; 3 for four to six months; 2 for ten months; 3 for a year; 1 for eighteen months; 2 for twenty months and one for twenty-nine months. Four are still living; in 2 cases it has been six months since the treatment and in 2 ten months. From these results the authors have decided to give up radium treatment in operable cases. Surgical removal of the tumor is the treatment of

choice. The prostatectomy should be total and extracapsular, removing in one block the prostate and seminal vesicles, the beginning of the vas deferens and the neck of the bladder as well as the fibrous walls of the aponeurotic bed of the prostate. The only hope of better results is to make an early diagnosis while the cancer is still limited to this zone which can be removed. As soon as this limit is passed surgery is no longer effective and radium may be tried with a view to cutting off the lymphatic routes by which the cancer is spread. In the period of invasion of the bladder or of prostatopelvic cancer radium is contraindicated. The only thing that can be done is to perform palliative operations, such as cystostomy which relieve the patient's suffering and prolong his life somewhat. Radium in these cases may cause rapid metastasis or serious intoxication in addition to violent pain.

Naldo, Nicolis. Roentgen therapy of fibromyomas of the uterus with one treatment. *Arch. di radiol.*, Jan-Feb., 1926, ii, 57–70.

The author treated 30 cases from December, 1921 to November, 1923 by this method. He gives a table showing the age of the patients, the part of the intermenstrual period at which the treatment was given and the outcome with regard to cessation of menstruation and disappearance of the tumor. Twenty-seven of the patients were cured and in 3 there was recurrence, one in six months, one in eight months, and one in nine months. These patients were given another treatment and 2 were cured, while in the third hysterectomy had to be performed. In the great majority of cases the uterus remained slightly enlarged and irregular. At first the regression of the tumor was quite rapid, until it had been reduced about half and after that there was a period of slower decrease. The regression began immediately after the treatment, sometimes before amenorrhea was established and was sometimes accompanied by a copious white discharge.

He tried as far as possible to irradiate in the first half of the intermenstrual period because if the rays act at this time on a mature follicle or young corpus luteum they prevent the formation of those substances which stimulate the next menstruation, while if the irradiation is performed in the second half of the intermenstruum the hormones which stimulate the next menstruation have already been poured into the circulation and premenstrual changes have already begun more or less. Excluding the 10 cases in which it was not possible to determine the time in the intermenstrual period, among the 14 irradiated in the first half there was immediate amenorrhea in 4, or 28.5 per cent, in 7 there was menstruation only once and in 3 two menstruations, or 21.5 per cent. Among the 6 irradiated in the second half of the intermenstruum there was one menstruation in one case, or 16.6 per cent, two menstruations in 4, or 66.6 per cent and three menstruations in 1, or 16.6 per cent.

Seitz and Wintz recommend 34 per cent of an erythema dose, but the author allowed 40 per cent. He used a tube which gives a dose of 20 per cent at a depth of 10 cm. with a skin distance of 25 cm. If the ovary is not more than 10 cm. distant from the skin an anterior and a posterior field on each side are enough. In case of very large fibroids in stout women where the ovary is probably deeper the number of fields may be increased. In general, the Germans try to act indirectly on the tumor through the ovary, while the French prefer to act directly on the tumor cells. But the author believes the difference is theoretical rather than practical and the results are about the same with the two methods.

He emphasizes the importance of being certain of the diagnosis of fibroid before giving the treatment, preferably by histological examination of material obtained by curettage, because roentgen treatment has often been blamed for causing cancerous degeneration of fibroids when as a matter of fact the tumor was probably malignant to begin with.

The signs of artificial menopause brought about by the treatment do not differ at all from those of the normal menopause. The injuries sometimes complained of in roentgen treatment of fibromas of the uterus, such as roentgen dermatitis, proctitis, cystitis, etc., are to be attributed to errors in technique rather than to the method itself and can be avoided with sufficient care. He has seen general roentgen sickness only in women who were in a poor condition of nutrition and anemic.

Gunsett, A. Cancer of the bladder and deep roentgen treatment, *J. de. radiol. et d'électrol., Par.*, January, 1926, x, 14–20.

Cancer of the bladder is generally so malignant and operative mortality so high that an attempt at roentgen treatment is completely justified. The author gives the clinical histories of 11 cases treated by roentgen therapy. In 6 of them he succeeded in bringing about complete disappearance of the bladder tumor, which in some of the cases was very extensive. In one case the treatment was postoperative after extirpation of the tumor. The other 4 cases were failures. Among 6 cases in which the tumor disappeared 2 of the patients have died.

One of them died of a rectal tumor which was independent of the bladder tumor and one died of an intestinal disease the nature of which is not entirely clear, but the bladder tumor did not recur. Among the other 4 cases, 2 are recent, one dating from March, 1922; this patient is free of recurrence after three years and is working at his trade as a house-painter. The other operation was in the beginning of 1923 and the patient is still in perfect condition.

The results of deep roentgen therapy of cancer of the bladder are therefore not important and the best course to follow is in cases which are still operable by partial cystectomy to operate, followed by postoperative roentgen treatment. If the tumor is inoperable roentgen treatment is indicated. This might be advantageously combined with radium treatment, the radium tubes being introduced by means of a cystoscope or a Nélaton catheter. This is the method which the author intends to follow in cases resistant to roentgen treatment.

Hernaman-Johnson, F. The treatment of rodent ulcer. *Lancet, Lond.*, Feb. 20, 1926, i, 389–391.

The treatment of choice in the case of "virgin" rodent ulcers is radiation therapy. Clinical experience leads the author to believe that concentration of roentgen-ray dosage may give good results in many cases, and the method is a convenient one; but it affords no guarantee against recurrence. Radium treatment suffers from the same disadvantages. Not only do recurrences appear with any form of radiation treatment, but as a rule the tumors yield slowly if at all to further application of the same type of radiation. On the other hand, a method which is in essence stimulative, such as the so-called ionization with zinc, may effect a cure. In the case of a recurrence, rays of a different wave length from those originally used should be employed. If improvement is not manifest within a month, some method of resensitizing the tissues, as by curettage or ionization, should be resorted to, after which radiation may again be given a trial.

If the above methods do not produce definite and continuous improvement at the end of two months, the diathermic cautery should be employed. This method owes its success not merely to destruction of cancer cells, but to the sharp reaction produced in the surrounding tissue. If all recurrences are dealt with promptly there should be no need for surgery in the ordinary sense of the term. When, however, the recurrence has already assumed large proportions it may be necessary to invoke the aid of the plastic surgeon to make good what has been destroyed.

Solomon, I., and Blondeau, A. Roentgen therapy of papilloma of the larynx. *J. de radiol. et d'électrol., Par.*, March, 1926, x, 112–114.

Papilloma of the larynx is seen chiefly in children from two to six years of age. Under surgical treatment the prognosis has been rather serious; tracheotomy is almost always necessary and the papillomas recur constantly, so that although they are benign they are very troublesome because of the interference with respiration and speech and because of the necessity for repeated operations.

The authors describe a case in a young man aged seventeen who had had papillomas since the age of seven; at first he was hoarse and then had progressive aphonia until at last he could only whisper. He had had four laryngeal operations in 1918 and 1919; the dyspnea increased progressively and tracheotomy had to be performed in 1920.

Roentgen treatment was commenced Jan. 14, 1925. Laryngoscopic examination at this time showed papillomas almost completely covering both vocal cords. From Jan. 14 to Feb. 11 he was given a total dose of 7000 R on two cervical fields, right and left with very penetrating rays (spark gap 40 cm.), filtered through 0.5 mm. copper and 2 mm. aluminum. A dose of 1000 R was given twice a week. Ten days after the beginning of treatment the tracheal cannula could be removed, respiration improved and laryngoscopic examination immediately after the last treatment showed great decrease of the papillomas. Fifteen days after the last treatment his voice was almost normal. As there were still some papillomatous vegetations nine weeks after treatment a second series of irradiations were given which were not well borne and treatment was stopped after 3000 R had been given. The patient was seen in October, 1925 and is completely well; nothing abnormal can be seen but a notch in the posterior part of the left vocal cord from one of the operations. He can speak normally and even sing. One of the authors treated two patients in 1920 and 1921; their history was about the same as that of the above case. They were treated with moderately penetrating rays (100 kilovolts, filtration through 10 mm. aluminum) and the total dose of 8000 R was distributed over a period of twelve weeks. There was permament cure in both cases.

Jüngling has always been able to cure papillomas of the larynx with one roentgen treatment; he irradiates through two cervical fields and gives a dose which he estimates at 80 per cent of the skin erythema dose. He has never seen recurrence, after a period of observation of three years, nor has he ever seen any lesions

caused by the rays. The authors consider roentgen therapy the treatment of choice for papillomas of the larynx as it quickly brings about permanent cure without any scars to interfere with respiration or phonation.

WINTZ, H. Experiences in the irradiation of breast cancer. *Brit. J. Radiol.*, April, 1926, xxxi, 150–156.

A review of cases treated at the Erlangen Clinic confirms the facts already found concerning uterine carcinoma. Breast cancer must be treated in the initial stages to yield the best results. An analysis of 106 cases is given in Table 1. Under the heading "lost" are included all those who died whether of carcinoma or of intercurrent disease, those who could not be followed up, and also patients who were at the point of death at the end of the three years, whether from cachexia or from distant metastases.

TABLE 1

Steinthal Grouping	Patients			Clinical Cures Per Cent
	Treated	Cured	Lost	
I	21	20	1	95.2
II	41	28	13	68.2
III	44	8	36	18.1

Another analysis is presented in Table II. The cases comprising Groups I and II of the Steinthal classification are combined here in order to avoid small figures.

TABLE II

After Treatment Years	Steinthal Grouping	Patients		Clinical Cures Per Cent
		Treated	Cured	
3	I and II	62	48	77
3	III	44	8	18.1
4	I and II	47	31	65.9
4	III	36	3	8.5
5	I and II	35	17	48.5
5	III	11	2	18.8
6	I and II	28	9	32.1
6	III	10	1	10.0
7	I and II	15	3	20.0
7	III	4		

As regard Group III, the favorable percentage shown is not as a rule found in surgical statistics. The results shown under Group II are better than the average results found in surgical statistics. In Group I there is undoubtedly an ideal ground for competition between the surgical and roentgen treatments. Only the statistics of the best surgeons, however, should be taken into consideration. The author believes that if satisfactory results are to be obtained three years after conclusion of treatment, the roentgen treatment alone is not sufficient.

The author is no longer of the opinion that prophylactic treatment should be given soon after operation. One should wait until nodules on the skin or gland metastases give pronounced indications for treatment. If no such indications occur, the author waits six to eight months after operation and then administers a dose of 90 to 100 per cent of a skin unit to the whole region involved. It happens not infrequently that shortly after operation and in consequence of it, the cancer is spread through the body by the circulation and that metastatic nodules and vertebral metastases develop. If, in fact, such infection has taken place, then roentgen treatment is useless and the patient dies of multiple metastases whether treated by roentgen rays or not. One might object that the period of waiting until symptoms of secondary deposits appear might be dangerous, because in that time the cancer cells might have opportunity to spread and because recurrences or metastasis might be so slight that the usual methods would not suffice to disclose them. Whether these objections are justified remains to be determined.

WINTZ, HERMANN. Experience with the roentgen treatment of carcinoma. *Strahlentherapie*, 1926, xxi, 368–379.

In carcinoma therapy two different aspects should be considered: one is the roentgen irradiation which is intended to destroy the carcinoma cells; and the second is the treatment of the carcinomatous individual, which has two aspects, namely, (*a*) the local treatment at the site of the carcinoma, and (*b*) the general treatment of the whole body. The destruction of the carcinoma cell by roentgen rays is a physical problem which is of course guided by medical knowledge. The local and general treatment of the body is a biological problem involving primarily reconstruction.

In the irradiation of carcinomas, the author has always aimed to administer the full dose at one sitting and has used divided doses only when the apparatus available did not permit administration of the full dose. Division of a certain dose over a period of several days means a diminution of the biological effect. The latter statement may now be regarded as a law because it has so often been demonstrated that its truth can no longer be doubted. The best example of this is the castration dose. If the dose of 34 per cent of the skin unit is administered over eight days instead of at one sitting, one finds that ovarian function is not eliminated. It is only when the eight day dose is increased to 50–52 per cent of the skin unit that an effect is obtained equal to that of a single application of 34 per cent of the skin unit.

Local treatment is to be employed only in very special cases. Experience has shown that in general, the irradiated tumor should be allowed to regress without disturbance. Irritation should be avoided and experience has likewise shown that inflammations must be controlled if a successful treatment of the cancer is to be hoped for. The author believes that electrolysis and cataphoresis to produce a deep antisepsis with copper is a valuable aid.

General treatment of carcinoma should support reconstruction and restitution. Although there is no single means that can be recommended without reserve, the employment of arsenic and general clinical factors for improving the bodily condition are very important. Residence at high altitudes appears to be an adjuvant to roentgen therapy that should not be overlooked.

Recent experience shows that 15 per cent of cases of carcinoma appear to succumb to the disease despite the most favorable conditions to cure, such as early diagnosis, early treatment, excellent physical condition of the host, etc. For the present we possess no prognostic signs which will detect these individuals in whom apparently a dissemination of the carcinomatous condition occurs almost simultaneously with the appearance of the local tumor. It is evident, therefore, that one cannot expect 100 per cent cures and that the limit should lie at 85 per cent. The major portion of the cases treated by the author were cases of carcinoma of the uterus, 800 of the cases having been observed five years after conclusion of treatment. By deep roentgen treatment and occompanying after treatment about 60 per cent of operable carcinomas of the portio vaginalis can be controlled; and in inoperable cases the number was from 10 to 14 per cent five years after completion of treatment. For the whole series this corresponds to an absolute cure of about 20 per cent.

The radiation treatment of mammary carcinoma does not show up so favorably at present as the radiation treatment of carcinoma of the portio vaginalis, and there are authors who deny the right of the roentgen therapist to treat operable mammary carcinoma exclusively with roentgen rays.

A summary is presented of the three-year cures after exclusive surgical treatment in various clinics. These show 68 to 100 per cent cures in Group I, 19 to 43 per cent in Group II and 0 to 29 per cent in Group III (the groupings referring to the Steinthal classification of mammary carcinomas). The author obtained 95 per cent three-year cures in 21 cases in Group I; 68 per cent of 41 cases in Group II and 18 per cent of 44 cases in Group III. Combining Groups I and II he obtained 77 per cent three-year cures, 66 per cent four-year cures, 49 per cent five-year cures and 32 per cent six-year cures. The figures given include all the cases without subtraction of those dying of intercurrent disease. If the latter had not been included the five-year cures would have amounted to 63 per cent. The author is no longer sure of the value of irradiation promptly after operation in mammary carcinoma. It appears more advisable to wait for five or six months after operation to administer postoperative roentgen treatment or when a skin metastasis indicates the need for it. This opinion seems to be confirmed by the author's statistics. Prophylactic treatment after a radical operation yielded 57 per cent of three-year cures, while the primary irradiation of mammary carcinoma in Groups I and II of Steinthal yielded 77 per cent.

There is at present no longer any doubt as to the justification for an exclusive irradiation of carcinoma of the uterus with roentgen and radium rays. As regards mammary carcinoma, the conditions are much more complicated, while in uterine carcinoma the primary mortality is very high and the end results from operation are less satisfactory, we find on the other hand, in early mammary carcinoma the operative mortality is extraordinarily low and the permanent results obtained by all prominent surgeons are quite excellent. Consequently if roentgen therapy is to compete with operation the permanent results attained by surgery would have to be equalled at least. The author has indicated that exclusive radiation therapy of mammary carcinoma in operable cases can be made to yield the desired results. There is need, however, for a more extensive series of cases before the fact can be considered demonstrated.

Lentze, F. A. Gallstones and gall-bladder carcinoma. *Beitr. z. klin. Chir.*, 1926, cxxxvii, 38–62.

A statistical analysis of the reports from various clinics shows an undoubted causal relationship between gallstones and carcinoma of the gall-bladder. The figures, however, do not permit a conclusion as to which of the conditions is the primary one. Even though such a proof is absent nevertheless the probabilities are all in favor of the idea that the gallstones appear first.

There is therefore in gallstone carriers at the age of forty a not inconsiderable danger of the development of a subsequent cancer of the gall-bladder; and this hazard increases with the years. These considerations consequently should be kept in mind when weighing the various factors influencing the indication for operative removal of the gall bladder.